August 24, 2020

Kemba Anderson
Branch Chief for Fluid Minerals
Bureau of Land Management
Nevada State Office
1340 Financial Blvd.
Reno, Nevada 89502-7147

Via: E-mail[1] at blm_nv_eoi)nominations@blm.gov

Protest of the September 2020 Oil and Gas Lease Sale Environmental Assessment
(DOI-BLM-NV-B000-2020-0009-EA)

Dear Ms. Anderson,

After conversations with the Battle Mountain District Office, we became aware that the seven parcels from the NV June 2020 Lease Sale (which were postponed), will now be included in the September 2020 Lease Sale. We remain extremely concerned about the seven parcels from the June 2020 proposed lease sale in the Battle Mountain District. We have significant concerns including potential impacts to wilderness-quality lands, the leasing of federal lands unlikely to produce oil or gas, climate impacts, and the continued leasing during the COVID-19 pandemic.

Please accept this timely protest of seven parcels listed below in the September Oil and Gas Lease Sale in the Battle Mountain District.[2] The protesting parties are The Wilderness Society, and the Toiyabe Chapter of the Sierra Club. In this lease sale, BLM is proposing to lease 7 parcels that would cover approximately 10,459.14 acres of public lands. We are incorporating our previous June Protest that covers the seven parcels.

Sincerely,
Rhiannon Scanlon

Policy and Planning Specialist
The Wilderness Society
1660 Wynkoop St. #1150
Denver, CO 80202
rscanlon@tws.org

[1] BLM states in their Lease Sale Notice that protests will be accepted by electronic mail. *See* September 8, 2020 Bureau of Land Management Notice of Competitive Oil and Gas Internet Lease Sale (July 24, 2020), *available at* https://www.blm.gov/sites/blm.gov/files/NV_OG_20200908_Sale_Notice_Signed%20%281%29.pdf

[2] As August 23, 2020 was a weekend, the public office was closed. The next day that the office is open to the public is August 24, 2020.

Brian Beffort
Toiyabe Chapter Director
Sierra Club
176 Greenridge Dr.
Reno, NV 89509

I. Lease Parcels Protested

NV-2020-06-0013
NV-2020-06-0019
NV-2020-06-0020
NV-2020-06-1273
NV-2020-06-1280
NV-2020-06-1291
NV-2020-06-1294

II. Interests of the Protesting Parties

The Wilderness Society ("TWS") has a long-standing interest in the management of BLM lands proposals and oil and gas leasing that could potentially affect wilderness-quality lands and other important natural resources on our public lands and mineral estate. TWS represents more than one million members and supporters nationwide, including members and supporters in Nevada, all of whom have a great interest in the protection and enhancement of the natural values and recreational opportunities provided by our public lands, including lands that are included in or may be affected by Nevada September 2020 lease sale.

The ***Sierra Club*** is a national nonprofit organization of approximately 784,000 members dedicated to exploring, enjoying, and protecting the wild places of the earth; to practicing and promoting the responsible use of the earth's ecosystems and resources; to educating and enlisting humanity to protect and restore the quality of the natural and human environment; and to using all lawful means to carry out these objectives. The Toiyabe Chapter of the Sierra Club has approximately 6,600 members in Nevada and the Eastern Sierra, including members who live and recreate in the Battle Mountain District. Sierra Club members use the public lands in the Battle Mountain District, including lands and waters that would be affected by actions under the lease sale, for quiet recreation, aesthetic pursuits, and spiritual renewal. These areas would be threatened by increased oil and gas development that could result from the proposed lease sale.

III. Authorization to File this Protest

Rhiannon Scanlon is authorized to file this protest on behalf of The Wilderness Society and its members and supporters. She has been given like authority to file this protest on behalf of the Sierra Club.

May 26, 2020

Kemba Anderson
Branch Chief for Fluid Minerals
Bureau of Land Management
Nevada State Office
1340 Financial Blvd.
Reno, Nevada 89502-7147

Via: Email[1] at blm_nv_eoi_nominations@blm.gov

Protest of the June 2020 Oil and Gas Lease Sale Environmental Assessment
(DOI-BLM-NV-B000-2020-0007-EA)

Dear Ms. Anderson,

Please accept this timely protest of the above Oil and Gas Lease Sale in the Battle Mountain District.[2] The protesting parties are The Wilderness Society, and the Toiyabe Chapter of the Sierra Club. In this lease sale, BLM is proposing to lease 7 parcels that would cover approximately 10,459.14 acres of public lands.

I. Lease Parcels Protested

We protest the sale of all seven parcels that are being offered in the Battle Mountain District. This protest is filed under the provisions at 43 C.F.R. § 3120.1-3. The parcel numbers and serial numbers that are protested are also shown in the Appendix to this protest. Notably, the parcels at issue are in areas that are still in disputed ownership with the Western Shoshone Nation.[3] Accordingly, they are not appropriate for lease sale.

II. Interests of the Protesting Parties

The Wilderness Society ("TWS") has a long-standing interest in the management of BLM lands

[1] BLM states in their Lease Sale Notice that protests will be accepted by electronic mail. *See* June 9, 2020 Bureau of Land Management Notice of Competitive Oil and Gas Internet Lease Sale (April 24, 2020), *available at* https://www.blm.gov/sites/blm.gov/files/NV_OG_20200424_Sale_Notice_Signed.pdf

[2] BLM issued an Errata to the Lease Sale Notice correcting the protest due date to May 24, 2020. BLM states that if the office is not open to the public on the due date, that a protest received on the next day the office is open to the public will be considered timely filed. As May 24, 2020 was a weekend and May 25, 2020 was a holiday, the public office was closed. The next day that the office is open to the public is May 26, 2020. *See* Errata #1 (April 28, 2020), *available at* https://www.blm.gov/sites/blm.gov/files/NV_OG_20200609_MD_Sale_Errata_1_0.pdf

[3] *See* Steven Newcomb, *Convoluted U.S. 'Logic' About the Western Shoshone Nation and its Territory*, Indian Country Today (Apr. 23, 2014), *available at* https://indiancountrytoday.com/archive/convoluted-u-s-logic-about-the-western-shoshone-nation-and-its-territory-rZl0p7cBXU2V5ipprxhE9w ("The Western Shoshone Nation has never ceded or relinquished its territory by a ratified treaty with the United States as required by the organic act establishing the Territory of Nevada. The Treaty of Ruby Valley was not a treaty of cession or relinquishment. And, according to the act that established the territory of Nevada, no Indian land shall become part or any state or territory until such time as the Indians enter into a treaty with the United States by which they transfer their lands to the United States.")

in Nevada and engages frequently in the decision-making processes for land use planning, project proposals and oil and gas leasing that could potentially affect wilderness-quality lands and other important natural resources on our public lands and mineral estate. TWS represents more than one million members and supporters nationwide, including members and supporters in Nevada, all of whom have a great interest in the protection and enhancement of the natural values and recreational opportunities provided by our public lands, including lands that are included in or may be affected by Nevada June 2020 lease sale.

The ***Sierra Club*** is a national nonprofit organization of approximately 784,000 members dedicated to exploring, enjoying, and protecting the wild places of the earth; to practicing and promoting the responsible use of the earth's ecosystems and resources; to educating and enlisting humanity to protect and restore the quality of the natural and human environment; and to using all lawful means to carry out these objectives. The Toiyabe Chapter of the Sierra Club has approximately 6,600 members in Nevada and the Eastern Sierra, including members who live and recreate in the Battle Mountain District. Sierra Club members use the public lands in the Battle Mountain District, including lands and waters that would be affected by actions under the lease sale, for quiet recreation, aesthetic pursuits, and spiritual renewal. These areas would be threatened by increased oil and gas development that could result from the proposed lease sale.

III. Authorization to File this Protest

As an attorney for The Wilderness Society, Bruce Pendery is authorized to file this protest on behalf of The Wilderness Society and its members and supporters. He has been given like authority to file this protest on behalf of the Sierra Club.

IV. Statement of Reasons

The protesting parties filed detailed comments on March 25, 2020, on the proposed lease parcels, as described in the Environmental Assessment (EA) prepared by Battle Mountain District on February 24, 2020. The majority of our comments were inadequately addressed or were not address at all. Therefore, many elements of this protest remain unchanged from the issues we raised in the March comments, and we ask the BLM to consider those concerns at this time. For that reason, our previous comments are incorporated into this protest by this reference, and we ask that they be fully considered as part of it. We have significant concerns with the proposed lease sale, including potential impacts to wilderness-quality lands, the leasing of Federal lands unlikely to produce oil or gas, climate impacts, and the disputed ownership with the Western Shoshone. Our comments detail these concerns below.

A. Public Participation

We appreciate BLM's decision to link this lease sale's ePlanning site to the agency's official webpage for oil and gas lease sales in Nevada, per our March 25th comments.

On April 16, 2020, TWS along with several other organizations sent a letter to BLM Nevada State Office Director Jon Raby, requesting a formal pause on new and ongoing BLM public participation processes. The unprecedented national health crisis is making it exceptionally difficult for people

to participate in public comment and protest processes, and many are unable to participate at all. BLM's public rooms are closed (making it difficult to conduct research or deliver lease sale protests), and state and local orders are encouraging people to stay at home and limiting travel. The guidelines issued by the Center of Disease Control in response to the COVID-19 pandemic have greatly disrupted the working and living conditions across the country, impairing the ability of the general public, issue experts and others to conduct their daily routine, regular business, and/or weigh in on Federal government actions that affect them. Moving forward with comment periods and decisions that will grant leases for at least ten years when the public is unable to properly participate violates the requirements of NEPA and FLPMA.

Members of Congress, attorneys general, and state and local governments have submitted requests that the federal government pause or extend public comment periods for rulemaking efforts and other processes during the novel COVID-19 pandemic.[4] Administrative actions and public comment periods for other federal agency actions are being suspended or extended for "to be determined" amounts of time due to the national emergency.[5] . Furthermore, in an April 3rd letter to the Department of Interior (DOI), Nevada Senators Catherine Cortez Masto and Jacky Rosen wrote "Public comment periods are an incredibly important tool for ensuring that the public has a role in making federal decisions with significant environmental, economic, and cultural impacts" and requested that DOI indefinitely extending open comment periods and suspending new comment periods due to the national emergency. BLM should heed these many indications that it is not responsible to move forward with lease sales.

In addition, the Mineral Leasing Act (MLA) requires BLM to give notice of proposed leasing and that "[s]uch notice shall be posted in the appropriate local office of the leasing and land management agencies." 30 U.S.C. § 226(f). Clearly, BLM cannot comply with this requirement right now.

Proceeding with lease sales would violate the public participation requirements of the Federal Land Policy and Management Act (FLPMA) and National Environmental Policy Act (NEPA). As BLM has recently been reminded, "[p]ublic involvement in oil and gas leasing is required under FLPMA and NEPA" and "the public involvement requirements of FLPMA and NEPA cannot be set aside in the name of expediting oil and gas lease sales." *Western Watersheds Project v. Zinke*, Memorandum Decision and Order, Case 1:18-cv-00187-REB (D. Idaho February 27, 2020), pp.

[4] *See, e.g.,* letter from fourteen House of Representatives Committee Chairs to Office of Management and Budget , Acting Director Russell Vought, submitted April 1, 2020: https://www.eenews.net/assets/2020/04/02/document_gw_08.pdf; letter from Senators Wyden, Merkley, and Udall to Secretary Bernhardt requesting a pause on comment periods, submitted April 3, 2020: https://www.wyden.senate.gov/imo/media/doc/040320%20Letter%20on%20DOI%20comment%20periods.pdf; letter from state attorney generals to Office of Management and Budget, Acting Director Russell Vought, submitted March 31, 2020: https://portal.ct.gov/-/media/AG/Press_Releases/2019/COVID-19-Rule-Delay-Letter---Final.pdf?la=en; Letter from various state and local government organizations requesting a pause on all public comment and rulemaking processes, submitted March 20, 2020: https://www.nga.org/letters-nga/state-and-local-government-organizations-seek-pause-on-public-comments-on-rulemaking-processes/

[5] For example, DOI's Interior Board of Land Appeals extended all filing deadlines by 60 days in response to COVID-19; the Daniel Boone National Forest Supervisor suspended the public objection period for its planning effort in light of COVID-19; and the U.S. Forest Service extended a public comment period for the Nantahala and Pisgah forest plan revision with the length of time to be determined (available at: https://www.fs.usda.gov/detail/nfsnc/home/?cid=stelprdb5397660).

32, 40. In particular, FLPMA requires that BLM give "the public adequate notice and an opportunity to comment upon the formulation of standards and criteria for, and to participate in, the preparation and execution of plans and programs for, and the management of, the public lands." 43 U.S.C. § 1739(e). NEPA requires that "environmental information is available to public officials and citizens before decisions are made and before actions are taken" and reiterates that "public scrutiny is essential to implementing NEPA." 40 C.F.R. § 1500.1(b). NEPA obligates the BLM to "[m]ake diligent efforts to involve the public in preparing and implementing their NEPA procedures." 40 C.F.R. § 1506.6(a).

Furthermore, the adequate enforcement of environmental laws is not possible during COVID-19. Not only are there significantly higher numbers of people working from home or who have been laid off, limiting the ability of governments to respond to emergencies on the ground, but state and federal governments have actively suspended many routine inspections and enforcement. BLM and the Environmental Protection Agency, as well as Colorado agencies, all have different responsibilities when it comes to responding to spills, water contamination, air quality issues, etc. Several of these agencies have made public declarations that they will not be conducting normal inspections and enforcement during the pandemic[6], and we do not see how BLM can be keeping up with normal practices. This makes planning for increased oil and gas operations through additional lease sales especially inappropriate and dangerous.

B. BLM does not adequately consider or provide for the protection of Lands with Wilderness Characteristics

1. BLM should defer parcels that overlap with inventoried lands with wilderness characteristics until management decisions are made for those lands in order to comply with the National Environmental Policy Act and Federal Land Policy and Management Act.

Lands with wilderness characteristics (LWC) are one of the resources of the public lands that must be inventoried and considered under the Federal Land Policy and Management Act (FLPMA). 43 U.S.C. § 1711(a); *see also Ore. Natural Desert Ass'n v. BLM.*, 625 F.3d 1092, 1122 (9th Cir. 2008). Of the seven lease parcels proposed for the June 2020 lease sale in the Battle Mountain District, all seven parcels overlap with three BLM-recognized LWC units covering 9,739 acres. EASI at Table 4 (presenting the LWC unique identifier numbers and the lease parcels overlapping them and the acreage of overlap). The underlying Shoshone-Eureka Resource Management Plan (RMP) does not address LWC. BLM states that LWC will be addressed in future RMP amendments. See EA at 43. BLM has not yet made decisions in its land use plans for how these areas will be managed relative to their wilderness characteristics.

These leases are being offered under the provisions of the outdated Shoshone-Eureka RMP (1986 and amended in 2006). BLM is developing a new draft RMP for the Battle Mountain District, including alternatives that may place new restrictions on oil and gas leases. Leasing within this area during a land-use plan revision unnecessarily shrinks the BLM's decision space to use an

[6] See EPA Suspends Enforcement of Environmental Laws Amid Coronavirus, March 26, 2020, available at https://thehill.com/policy/energy-environment/489753-epa-suspends-enforcement-of-environmental-laws-amid-coronavirus

updated analysis and determine where or how leasing is now appropriate. More importantly, because the public has not been able to weigh in on where or how to offer oil and gas leases in this region for several decades, leasing now severely limits public engagement in the draft plan. This action erodes public trust. Mineral rights bestowed by selling leases now will restrict future management actions. We greatly appreciate that BLM has completed an inventory of LWC in the Battle Mountain District consistent with and agency policy. EA at 43. However, BLM must preserve its ability to decide whether and how to protectively manage those newly inventoried wilderness resources in a public planning process. Such decisions could be foreclosed by leasing those lands to the oil and gas industry at this time. Unfortunately, the BLM states in the EA that the Shoshone-Eureka RMP does not address LWC and will be addressed in future RMP amendments, and therefore "[i]n the interim the District will manage lands with wilderness characteristics for multiple use." EA at 44. That is, despite having completed an inventory finding these lands do have wilderness characteristics, the BLM has no current plans to recognize wilderness values and will manage the lands under a general multiple use mandate that may not adequately recognize the wilderness values of these lands. In fact, BLM has stated that while LWC is present, it will not be affected. EA at 16. Yet later in the EA, BLM contradictorily states that:

> "Development and production could produce effects similar to those of exploration drilling but that would be more long-term and could potentially cause an inventory unit to no longer be considered to have wilderness characteristics under criteria (2) and (3) in a subsequent inventory, depending on such factors as the number and placement of wells and long-term facilities in relation to the unit's size, configuration, and topographic and vegetative screening; and the success of measures taken to minimize effects."

EA at 44.

Therefore, BLM should defer all parcels that overlap with inventoried LWC units until the agency has the opportunity to make management decisions for those areas through a public planning process. It is well within BLM's authority to defer nominated parcels from lease sales. Even if lands at issue here are open for leasing under the governing RMP, it would be entirely reasonable and consistent with BLM's obligations under FLPMA and the National Environmental Policy Act (NEPA) for BLM to consider deferring parcels that have important wilderness resources and/or other resources. Neither the Mineral Leasing Act (MLA), FLPMA, nor any other statutory mandate requires that BLM must offer public lands and minerals for oil and gas leasing solely because they are nominated for such use, even if those lands are allocated as available to leasing in the governing land use plan. The Tenth Circuit Court of Appeals confirmed this discretion in *New Mexico ex rel. Richardson v. BLM*, when it stated, "[i]f the agency wishes to allow oil and gas leasing in the plan area it must undertake additional analysis…but it retains the option of ceasing such proceedings entirely" 565 F.3d 683, 698 (10th Cir. 2009).

BLM regularly exercises this discretion to defer parcels in inventoried LWC for which the agency has not yet made management decisions. For example, the Grand Junction Field Office deferred lease parcels from its December 2017 lease sale in areas that BLM recently inventoried and found to have wilderness characteristics. BLM stated: "Portions of the following parcels were deferred due to having lands with wilderness characteristics that require further evaluation." DOI-BLM-CO-N050-2017-0051-DNA, p. 1. The Grand Junction Field Office completed its RMP revision in

2015, but still determined that it is inappropriate to lease areas that have been inventoried and found to possess wilderness characteristics since the RMP was completed to allow the agency to consider management options for those wilderness resources. In another example, the Bighorn Basin District Office in Wyoming deferred several parcels from Wyoming BLM's August 2013 lease sale because they overlapped with "Lands with Wilderness Characteristics inventory area" while BLM completed the RMP revision. DOI-BLM-WY-R010-2013-0014- EA at 4-37.

BLM must defer leasing in inventoried LWC for which management decisions have not been made. This approach is consistent with agency policy and authority and is critical to preserving BLM's ability to make management decisions for those wilderness resources through a public planning process.

C. BLM has failed to consider a reasonable range of alternatives.

Under NEPA, the BLM must consider a reasonable range of alternatives for this lease sale, including alternatives that would decrease the greenhouse gas (GHG) emissions resulting from its actions and alternatives that would mitigate remaining climate change impacts. 40 C.F.R. § 1502.14(a); *see also Theodore Roosevelt Conservation P'ship v. Salazar*, 661 F.3d 66, 72-73 (D.C. Cir. 2011) (requiring BLM to consider a reasonable range of alternatives for oil and gas activity). Yet, BLM often only considers two alternatives in its leasing analyses: leasing no parcels (the no action alternative) or leasing all (or nearly all) parcels that have been nominated. [This "all or nothing approach" violates NEPA, which requires Federal agencies to "study, develop, and describe appropriate alternatives to recommend courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." 42 U.S.C. 4332(2)(E); *see also* 40 C.F.R. § 1508.9(b) (an EA must include a discussion "of alternatives as required by section 102(2)(E)"). Although "an agency's obligation to consider alternatives under an EA is a lesser one than under an EIS," NEPA "requires that alternatives be given full and meaningful consideration" in both instances. *Native Ecosystems Council v. U.S. Forest Service*, 428 F.3d 1233, 1245–46 (9th Cir. 2005). "The existence of a viable but unexamined alternative renders an EA inadequate." *Western Watersheds Project v. Abbey*, 719 F.3d 1035, 1050 (9th Cir. 2013) (quotations and citations omitted). When determining whether an agency has considered an appropriate range of alternatives, courts look to the substance of the alternatives. *Native Ecosystems Council*, 428 F.3d at 1246. In particular, the agency must consider reasonable alternatives that facilitate informed decision-making and a "hard and careful look at [] impacts." *Western Watersheds Project*, 719 F.3d at 1051.

Here, BLM evaluates only two options: the proposed action (leasing all of the nominated parcels) and a no action alternative. An EA offering a choice between leasing every proposed parcel, and leasing nothing at all, does not present a reasonable range of alternatives. *See TWS v. Wisely*, 524 F. Supp. 2d 1285, 1312 (D. Colo. 2007) (BLM violated NEPA by failing to consider "middle ground compromise between the absolutism of the outright leasing and no action alternatives"). The court held that BLM should have considered a "potentially appealing middle-ground compromise between the absolutism of the outright leasing and no action alternatives," which would have reduced environmental impacts. *Id. See also Muckleshoot Indian Tribe v. U.S. Forest Serv.*, 177 F.3d 800, 813 (9th Cir. 1999) (NEPA analysis failed to consider a reasonable range of alternatives where it "considered only a no action alternative along with two virtually identical

alternatives"). [7]

This obligation applies to oil and gas planning and leasing decisions. As the Tenth Circuit has held, "[w]ithout substantive, comparative environmental impact information regarding other possible courses of action, the ability of [a NEPA analysis] to inform agency deliberation and facilitate public involvement would be greatly degraded." *New Mexico ex rel. Richardson v. BLM*, 565 F.3d 683, 708 (10th Cir. 2009).

A "rule of reason" is used to determine if a reasonable range of alternatives have been considered; this rule is governed by two guideposts: (1) the agency's statutory mandates; and (2) the objectives for the project. *New Mexico ex rel. Richardson*, 565 F.3d at 709. Here, there is no doubt that BLM's legal mandates under FLPMA and NEPA require it to fully consider the protection of wilderness values. Additionally, under IM 2010-117, which was largely reinstated by the decision in *Western Watersheds Project v. Zinke*, 336 F. Supp. 3d 1204, 1212 (D. Idaho 2018) the agency must treat the protection of other important resources and values as an equally important objective to leasing. *See also Western Watersheds Project v. Zinke*, Case No. 1:18-cv-00187-REB at 3-4 (D. Idaho, Feb. 27, 2020) (granting motion for summary judgement and finding IM 2018-034 provisions would be set aside and replaced by those in IM 2010-117). Although this case was decided within the context of the greater sage grouse habitat management areas, its reasoning applies to all oil and gas lease sales authorized under FLPMA and NEPA and completed under IM 2018-034.

In this lease sale, the BLM is proposing to sell seven parcels that overlap with three LWC inventory units that cover 9,739 acres. The BLM should consider not leasing or at least deferring leasing in these areas, or at a minimum, leasing the parcels with an NSO stipulation. Moreover, to the extent certain parcels have only low potential for development, the alternative of deferring them appears even more reasonable. These options have never been analyzed. Federal courts have held that site-specific analysis is required prior to issuing oil and gas leases where there is surface that is not protected by NSO stipulations and where there is reasonable foreseeability of environmental impacts. *See, e.g., New Mexico ex rel. BLM*, 565F.3d at 718.

Here, BLM has failed to evaluate a reasonable range of alternatives that would protect the wilderness characteristics of parcels in the Battle Mountain District from the impacts of the lease sale. Because the BLM has not considered any meaningful alternatives, such as include offering the parcels with NSO stipulations, they must defer the parcels from the lease sale.

D. Prioritizing oil and gas leasing is inconsistent with FLPMA's multiple use mandate.

Prioritizing oil and gas leasing over all other resources and values violates FLPMA's multiple use mandate, and prioritizing leasing of lands with low potential for oil and gas development exacerbates this violation. Leasing in low potential areas gives preference to oil and gas development at the expense of other uses because the presence of leases can limit BLM's ability to manage for other resources, in violation of FLPMA's multiple use mandate. Under FLPMA,

[7] *See also Colo. Envtl. Coal. v. Salazar*, 875 F. Supp. 2d 1233, 1248–50 (D.Colo. 2012) (holding that BLM unlawfully failed to consider an oil and gas leasing alternative that required minimal surface disturbance relative to the proposed action); *W. Org. of Res. Councils v. BLM*, CV 16-21-GF-BMM, 2018 WL 1475470, at *9 (D. Mont. Mar. 26, 2018) (similar); *Wilderness Workshop*, 342 F. Supp. 3d at 1166–67. (similar).

BLM is subject to a multiple use and sustained yield mandate, which prohibits the DOI from managing public lands primarily for energy development or in a manner that unduly or unnecessarily degrades other uses. *See* 43 U.S.C. § 1732(a) and (b). Instead, the multiple use mandate directs DOI to achieve "a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations." 43 U.S.C. § 1702(c). Further, as co-equal, principal uses of public lands, outdoor recreation, fish and wildlife, grazing, and rights-of-way must receive the same consideration as energy development. 43 U.S.C. § 1702(l).

DOI appears to be pursuing an approach to oil and gas management that prioritizes this use above others in violation of the multiple use mandate established in FLPMA. For example, a March 28, 2017, Executive Order and ensuing March 29, 2017, Interior Secretarial Order #3349 seek to eliminate regulations and policies that ensure energy development is balanced with other multiple uses. None of the overarching legal mandates under which BLM operates – be it multiple use or non-impairment – authorizes DOI to establish energy development as the dominant use of public lands. On our public lands, energy development is an allowable use that must be carefully balanced with other uses. Thus, any action that attempts to enshrine energy development as the dominant use of public lands is invalid on its face and inconsistent with the foundational statutes that govern the management of public lands.

The mere fact an RMP makes lands *available* for leasing does not mean that actually leasing the lands meets BLM's multiple use obligations. Given BLM's acknowledged discretion to engage in leasing, or not to lease, under the MLA, it is clear the leasing stage, as much as the planning stage, is when multiple use decisions should be made. Since land use plan decisions only set a basic framework for land management, and do not make project-specific decisions, it is clear the leasing stage is when decisions should be made about whether issuing a lease parcel would meet BLM's multiple use responsibilities, and this must be reflected in the NEPA analysis at the leasing stage, which has not occurred here.

Federal courts have consistently rejected efforts to affirmatively elevate energy development over other uses of public lands. In *New Mexico ex rel. Richardson*, the Tenth Circuit put to rest the notion that BLM can manage chiefly for energy development, declaring that "[i]t is past doubt that the principle of multiple use does not require BLM to prioritize development over other uses." 565 F.3d at 710; *see also S. Utah Wilderness Alliance v. Norton*, 542 U.S. 52, 58 (2004) (defining "multiple use management" as "striking a balance among the many competing uses to which land can be put"). Other Federal courts have agreed. *See, e.g., Colo. Envtl. Coalition v. Salazar*, 875 F. Supp. 2d 1233, 1249 (D. Colo. 2012) (rejecting oil and gas leasing plan that failed to adequately consider other uses of public lands). Thus, any action by BLM that seeks to prioritize oil and gas leasing and development as the dominant use of public lands, as this proposed sale of seven parcels appears to do, would violate FLPMA. BLM must consider a reasonable range of alternatives for this lease sale that considers and balances the multiple uses of our public lands, consistent with NEPA and FLPMA. BLM can – and should – consider an alternative eliminating oil and gas leasing in areas determined to have only moderate or low potential for oil and gas development. *See Wilderness Workshop,* 342 F. Supp. 3d at 1167 ("the principle of multiple use does not require BLM to prioritize development over other uses . . . [and therefore] it seems a reasonable alternative would be to consider what else may be done with the low and medium potential lands if they are not held open for leasing.") (internal citation and quotation omitted). An alternative eliminating

oil and gas leasing in areas determined to have no or low potential for oil and gas development would be "'significantly distinguishable' because it would allow BLM to consider other uses for that land." *Id*. at 1167 (citing *New Mexico ex rel Richardson*, 565 F.3d at 708–09).

E. Climate change impacts must be properly analyzed and considered

1. BLM's response to our previously submitted climate change comments are inadequate and in violation of NEPA

In the comments we submitted on the Nevada June 2020 oil and gas lease sale EA on March 25, 202,0 we provided the BLM with detailed comments on climate change issues that needed to be considered and means to reduce climate change impacts that BLM should adopt. The BLM has responded to those comments in the Summary of Comments and Responses section of the Lease Sale EA Supplemental Information, rejecting all our concerns. EASI at 48.

We would like to ask the BLM to reconsider the climate change issues we raised in our March EA comments as part of this protest. Therefore, we reincorporate those comments, including the Exhibits we provided, by this reference in their entirety into this protest. And we again ask the BLM to reconsider them.

In addition, there are two issues relative to climate change we raise as part of this protest. The first is a rebuttal to the responses to our climate change comments in the Summary of Comments and Responses section of the EA, which is provided in the following table. Second is the need to comply with the recent decision in *WildEarth Guardians v. U.S. Bureau of Land Mgmt.*, 2020 U.S. Dist. LEXIS 77409 (D. Mont., May 1, 2020) where the court vacated two lease sales in Montana partly due to an insufficient analysis of the cumulative impacts of climate change.

Comment	**BLM Response**	**Protest Rebuttal**
BLM must consider the risks and costs of climate change and should do an option value analysis to avoid irreparable damage	The proposed lease conforms with the purpose and need stated in the EA and complies with the MLA and applicable RMP.	The BLM must consider all relevant issues in the EA. An agency must "consider every significant aspect of the environmental impact of a proposed action." Baltimore Gas & Electric Co. v. Natural Resources Defense Council, 462 U.S. 87, 107 (1983) (quotations and citation omitted).
BLM must consider unquantified effects including the worldwide and long-range character of climate change.	This is outside the scope of the EA.	Considering climate change environmental impacts, including its worldwide effects and long-range character, is not outside of the scope of an EA. An EA must provide enough evidence to determine whether an EIS is needed and it must aid an agency's compliance with NEPA in any event. 40 C.F.R. §1508.9. NEPA requires consideration of all relevant environmental issues. 40 C.F.R. § 1500.2; 42 U.S.C. §§ 4331(b)(1)-(6), 4332(2)(A), (B), (C)(i)-(v), (F), and (H). An agency must "consider every significant aspect of the environmental impact of a proposed action."

		Baltimore Gas & Electric Co. v. Natural Resources Defense Council, 462 U.S. 87, 107 (1983) (quotations and citation omitted).
Methane emissions must be considered and the Social Cost of Carbon and Social Cost of Methane, and carbon sequestration issues.	Table 6 in the EA presents GHG emission estimates including for methane.	This does not address the concerns raised in our EA comments. Not only the amount of methane emissions needs to be considered; the climate change environmental impacts of those emissions must be considered, which is not the case. And the EA does not even consider SCC and SCM, or carbon sequestration.
GHG emissions must be quantified including downstream emissions and their direct, indirect, and cumulative climate impacts.	BLM presents GHG emissions levels in the EA and additional NEPA will be done at the project approval stage.	The BLM is not required to wait until the APD stage to do environmental analysis when such is possible before that time. See, e.g., New Mexico ex rel. Richardson v. Bureau of Land Mgmt., 565 F.3d 683, 707-708 (10th Cir. 2009) ("All environmental analyses required by NEPA must be conducted at the "earliest possible time."") (citations and quotations omitted). See also id. at 716 (assessment of an environmental impact must occur as soon as the impact is "reasonably foreseeable" and before any "irretrievable commitment of resources.").
A reasonable range of alternatives must be developed that considers GHG emissions.	Considering the two alternatives evaluated in the EA—no action and the proposed lease sale—met the requirements of NEPA. Statewide and national emissions levels are considered.	BLM's full consideration of only two alternatives in the EA does not meet NEPA requirements; BLM can at least reduce local GHG emissions and climate change impacts and this needs to be considered in the EA.
Mitigation of GHG emissions must be fully considered and option value must be considered.	This can only be done through RMP amendment or revision.	Considering issues like modifying the underlying RMPs is part of the reason for doing an EA and BLM should recognize and consider this. The BLM must ensure it fully complies with the court decisions in WildEarth Guardians, Wilderness Workshop, Diné Care, and San Juan Citizens Alliance, which are cited in the climate change comments on the EA that we submitted in March. It also must comply with the May 1, 2020 decision from Montana in WildEarth Guardians cited above and discussed in the next section below.
BLM cannot delay the climate change analysis to the APD stage.	The EA considers climate change to the extent possible.	Again, the BLM is not required to wait until the APD stage to do environmental analysis when such is possible before that time. See, e.g., New Mexico ex rel. Richardson v. Bureau of Land Mgmt., 565 F.3d 683, 707-708 (10th Cir. 2009) ("All environmental analyses required by NEPA must be conducted at the "earliest possible time."") (citations and quotations

		omitted). See also id. at 716 (assessment of an environmental impact must occur as soon as the impact is "reasonably foreseeable" and before any "irretrievable commitment of resources.").
BLM must consider the ecological, economic, and social impacts of GHG emissions.	The RFD scenario analysis meets this need.	The EA does not present the widespread direct, indirect, and cumulative environmental impacts of oil and gas leasing on climate change as required by the NEPA regulations. 40 C.F.R. § 1508.8(b)
Mitigation measures are needed to reduce these impacts.	Mitigation measures that "could be required" are described in the EA.	There is a need for mandatory mitigation measures to deal with climate change impacts.
The values of BLM lands for carbon sequestration need to be considered.	GHG emissions, and impacts, in Nevada are very low.	This does not answer the question. BLM could provide for ways to maximize carbon sequestration even if emissions are low, such as through careful management of any oil and gas development, with concomitant mandatory mitigation measures.
Methane waste must be minimized and waste minimization stipulations should be adopted in the lease sale.	BLM manages venting and flaring under the regulations at 43 C.F.R. Subpart 3179 and mitigation measures are described in the EA.	As discussed in our EA comments, BLM's current waste regulations do not meet the requirements in the MLA to "use all reasonable precautions" to prevent waste at the oil and gas leasing stage. See 30 U.S.C. §§ 187 and 225.
The Social Cost of Methane (SCM) protocol must be employed.	BLM does not know the impacts that might occur at the leasing stage and it can only provide stipulations.	The SCM protocol is a valuable tool that can help the BLM fully understand climate change impacts, and it should therefore be used.
The BLM must use an appropriate timeframe for estimating the global warming potential (GWP) of methane.	The BLM has considered 100-year and 20-year GWP for methane.	We appreciate that BLM has considered both timeframes.

2. BLM must comply with the decision in *WildEarth Guardians v. U.S. Bureau of Land Management.*

As we mentioned, BLM must ensure that it complies with the recent decision in *WildEarth Guardians v. U.S. Bureau of Land Mgmt.*, 2020 U.S. Dist. LEXIS 77409 (D. Mont., May 1, 2020). In that case the court vacated two lease sales (encompassing 287 leases covering 145,063 acres) and the FONSIs supporting the underlying EAs because the BLM failed to consider four issues (impacts to groundwater, consideration of alternatives to protect groundwater, climate change impacts, and issuing the FONSIs in an arbitrary and capricious manner). The Order from that case is included herewith as Exhibit 1.

Relative to climate change the court found the EAs did not support the lease sales because BLM failed to do the needed analysis of cumulative impacts. *WildEarth Guardians* at *24 to *34. BLM relied on its quantification of GHG emissions to support its claims it met the cumulative impact

analysis requirements, but while "[t]his information was thorough and necessary for BLM to comply with NEPA, [ ] none of it speaks to whether BLM considered *cumulative* climate impacts." *Id.* at *27 to *28 (emphasis in original). Moreover, BLM claimed that it met NEPA's cumulative impacts requirement by tiering the EAs to the relevant RMPs. *Id.* at It at * 28. But the BLM failed to consider lease sales outside of Montana in Wyoming, and this argument also failed because "the RMPs predate the lease sales by more than two years" and did not account for actions outside the planning area for the specific RMP. *Id.* *28 and *29. Moreover, "BLM cannot, as it claims, satisfy NEPA's cumulative impacts analysis simply because it put the emissions from a single lease sale into context with state and national greenhouse-gas emissions." *Id.* at *29. BLM contended that "the global nature of climate change prevents it from assessing "the specific effects of GHG emissions from any particular lease sale either on any particular region or on the planet as whole"" but this argument was rejected for three reasons, including that

- Even if BLM could not ascertain exactly how the projects contribute to climate change impacts in the project area "it knows that less greenhouse-gas emissions equals less climate change," and
- "The cumulative impacts analysis was designed precisely to determine whether "a small amount here, a small amount there, and still more at another point could add up to something with a much greater impact"" and "[t]hus, if BLM ever hopes to determine the true impacts of its projects on climate change, it can do so only by looking at projects in combination with each other, not simply in the context of state and nation-wide emissions."

Id. at * 30 to *31 (administrative record and case citations omitted).

Based on the decision in *WildEarth Guardians*, it is clear that BLM's climate change cumulative impacts analysis cannot be based on just a quantification of GHG emissions, cannot tier to RMPs that are more than two years old, the BLM must consider projects outside the planning area, the agency cannot contextualize GHG emissions from this lease sale with state and national GHG emissions, and even if climate change analysis is difficult, BLM must recognize that fewer GHG emissions will mean less climate change and it must consider projects in combination with each other, "not simply in the context of state and nation-wide emissions."

The cumulative impacts analysis in the EA for this lease sale fails in these regards. Among other things, the Shoshone Eureka RMP (Mt. Lewis Field Office) was approved in 1986, much more than two years ago, so it cannot be tiered to, especially relative to RFD projections. EA at 4. The EA's claim that leasing has no impacts on air quality and that any effects will not occur until the APD stage of development is unfounded. *Id.* at 22, 23, and 51. The cumulative impacts analysis cannot be postponed to the APD stage. GHG emissions estimates for the leases cannot form the basis for a cumulative impacts analysis; emissions from projects outside the planning area must be considered, which has not been done. *Id.* at 25, 26, 51, and 52. The claims of uncertainty about future climate change impacts does not meet the need to recognize that fewer GHG emissions will mean less climate change and potential projects must be considered in combination with each other. *Id.* at 26.

The significance of these concerns was made evident in BLM's denial of our protest of the March 24, 2020 lease sale in the Battle Mountain District. In that protest denial BLM based its claim that

the cumulative impacts analysis was sufficient on an assertion that the EA "compared the GHG emissions (MMT/yr CO2e) from the Proposed Action to total estimated all sectors GHG emissions in Nevada and the U.S. . . . ." March 2020 protest denial at 6. BLM claimed that since GHG emissions in Nevada are low, "based on the low amount of current production and projected production based on the Reasonably Foreseeable Development scenario, as compared to state, national, and worldwide consumption" BLM's analysis was adequate. *Id.* But as noted, "if BLM ever hopes to determine the true impacts of its projects on climate change, it can do so only by looking at projects in combination with each other, not simply in the context of state and nation-wide emissions." *WildEarth Guardians* at * 31.

3. Climate change poses an existential threat to our planet and humanity, with public lands playing a key role.

i. There is scientific consensus regarding the trajectory of human-caused climate change.

A large and growing body of scientific research demonstrates, with ever increasing confidence, that climate change is occurring and is caused by GHG emissions from human activities, primarily the use of fossil fuels. The Intergovernmental Panel on Climate Change (IPCC), has affirmed that:

> Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen. . . Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems.[8]

In 2009, the Environmental Protection Agency (EPA) issued a finding that the changes in our climate caused by elevated concentrations of GHG in the atmosphere are reasonably anticipated to endanger the public health and welfare of current and future generations. *See* Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66,496 (Dec. 15, 2009). The D.C. Circuit Court of Appeals upheld this decision as supported by the vast body of scientific evidence on the subject. *See Coal. for Responsible Regulation, Inc. v. EPA.*, 684 F.3d 102, 120–22 (D.C. Cir. 2012).

Most climatologists agree that, while the warming to date is already causing environmental problems, another 0.4 degree Fahrenheit rise in temperature, representing a global average atmospheric concentration of carbon dioxide (CO2) of 450 parts per million (ppm), could set in motion unprecedented changes in global climate and a significant increase in the severity of natural disasters—and could represent the point of no return. [9]

[8] *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2014 SYNTHESIS REPORT SUMMARY FOR POLICYMAKERS 2, (2014), https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf.
[9] *See* Doug Moss & Roddy Scheer, *Have We Passed the Point of No Return on Climate Change?*, SCIENTIFIC AMERICAN, (April 13, 2015), http://www.scientificamerican.com/article/have-we-passed-the-point-of-no-return-on-climate-change/.

The 2018 IPCC Special Report on Global Warming of 1.5°C found that human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels, and that warming is likely to reach 1.5°C between 2030 and 2052 at the current rate.[10] This landmark report warns that the 2°C maximum temperature threshold is no longer accurate, and that warming of 1.5°C beyond pre-industrial levels will cause grave social and economic damage. Additionally in 2018, the U.S. Global Change Research Program published the Fourth National Climate Assessment (NCA4), finding "that the evidence of human-caused climate change is overwhelming and continues to strengthen, that the impacts of climate change are intensifying across the country, and that climate-related threats to Americans' physical, social, and economic well-being are rising."[11]

The National Oceanic and Atmospheric Administration (NOAA) released the 2018 National Climate Report, a major scientific report by 13 Federal agencies saying that climate change could shrink the US economy by 10 percent if significant steps are not taken to address emissions.[12] The assessment predicts devastating impacts on the economy, public health, and the environment including, falling agricultural yields, longer fire seasons, disrupted export and supply chains, threats to water supplies, flooding, and outbreaks of disease, among other adverse impacts.

These reports emphasize the need to take immediate action to mitigate climate change impacts. Despite new data from the most reliable scientific sources, the Trump Administration's energy dominance policy continues to prioritize fossil fuel production and expand drilling on Federal lands. BLM must consider these reports in a climate change analysis and make decisions relative to potential land use allocations and oil and gas leasing and development in the Mount Lewis Field Office accordingly.

The Environmental Assessment (EA) for the BLM Nevada June 2020 lease sale largely does not consider these important studies.

ii. The impacts of climate change are already being felt and will intensify in the future.

According to the Cumulative BLM New Mexico Greenhouse Gas Emissions 2019 white paper, average temperatures in southern Colorado and New Mexico rose "just under 0.7 degrees Fahrenheit per decade between 1971 and 2001, which is approximately double the global rate of temperature increase." *See* BLM 2019 p. 7, citing Rahmstorf, S.G. (2012). Comparing Climate Projections to Observations up to 2011. *Environmental Research Letters,* 7:004035. Climate modeling estimates that temperatures in this region "may rise by 4-6 degrees Fahrenheit by the end of the 21st century, with warming increasing from south to north." *Id.*

As highlighted above, there is an abundance of scientific research describing how climate change

[10] *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, GLOBAL WARMING OF 1.5°C SUMMARY FOR POLICYMAKERS 6 (2018), https://www.ipcc.ch/site/assets/uploads/sites/2/2018/07/SR15_SPM_version_stand_alone_LR.pdf.

[11] U.S. GLOBAL CHANGE RESEARCH PROGRAM, FOURTH NATIONAL CLIMATE ASSESSMENT: VOLUME II IMPACTS, RISKS, AND ADAPTATION IN THE UNITED STATES 36 (2018), https://nca2018.globalchange.gov/downloads/NCA4_2018_FullReport.pdf [hereinafter NCA4].

[12] *See* NOAA NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION, STATE OF THE CLIMATE: GLOBAL CLIMATE REPORT FOR ANNUAL 2018 (2019), https://www.ncdc.noaa.gov/sotc/global/201813.

impacts will intensify in the future. The NCA4 found:

- The unprecedented droughts in the Colorado River Basin and California showed increased temperatures from climate change intensified the severity of the drought. Models project more drought under climate change, snowpack and streamflow decline in parts of the Southwest, and decreasing surface water supply reliability for cities, agriculture, and ecosystems. Declining streamflow to Lake Mead threatens lands in rural Nevada.
- The Southwest produces more than half of the nation's high-value specialty crops, which are irrigation-dependent and particularly vulnerable to extremes of moisture, cold, and heat. Reduced yields from increasing temperatures and increasing competition for scarce water supplies will displace jobs in some rural communities.
- Tree death across the western United States doubled from 1955 to 2007, likely due to increased heat, wildfire, and bark beetle infestations, all of which are mainly attributable to climate change.
- Increased warming, drought, and insect outbreaks, all caused by or linked to climate change, have increased wildfires and impacts to people and ecosystems. Fire frequency could increase by 25%, and the frequency of very large fires (greater than 5,000 hectares) could triple.
- Reductions in runoff would increase the salinity of Pyramid Lake in Nevada, reducing fish biodiversity and affecting the cui-ui fish, which is Federally endangered, and the primary cultural resource of the Pyramid Lake Paiute Tribe.
- Impacts specific to Indigenous peoples include declining vegetation, higher temperatures, diminished snow, and soil desiccation have caused dust storms and more mobile dunes on some Navajo and Hopi lands, resulting in damaged infrastructure and grazing lands and loss of valued native plant habitat. There is evidence that shows climate-related environmental changes on culturally important foods, practices, and mental and spiritual health.[13]

Marginalized communities and indigenous people often feel the impacts of climate change disproportionately. For instance, indigenous peoples tend to live in more natural environments and have a symbiotic relationship with nature. "This gives them an extraordinarily intimate knowledge of local weather and plant and animal life. Traditional wisdom on matters such as when to plant crops or where to hunt for food has been accumulated over many generations, but now that the climate is shifting, some of those understandings are proving to be no longer valid."[14] Climate change not only threatens their livelihood, but their culture, their language, and their way of life. Marginalized communities tend to live in places most vulnerable to the impacts of climate change. According to John Magrath, Programme Researcher at Oxfam:

> Minorities tend to live in the more marginal areas, exposed areas, that seem to be seeing more climate changes and are more susceptible to climate impacts because they have got less, and get less, from governments . . . . It is a characteristic of all the studies that I have seen, that the ethnic communities are the people who suffer most from climate impacts and

[13] NCA4 at 1107-1109.

[14] Rachel Baird, *The Impact of Climate Change on Minorities and Indigenous Peoples*, MINORITY RIGHTS GROUP INTERNATIONAL 4 (2018), https://minorityrights.org/wp-content/uploads/old-site-downloads/download-524-The-Impact-of-Climate-Change-on-Minorities-and-Indigenous-Peoples.pdf.

are the most vulnerable.[15]

Marginalized communities are more likely to live in neighborhoods with less tree cover to help reduce heat and more concrete to trap it. They also have less access to air conditioning. A 2013 study found that African Americans in Los Angeles have a heatwave mortality rate that is two times high than the city average.[16] A recent study found that formerly redlined neighborhoods are on average 5°F hotter than non-redlined neighborhoods.[17] Climate change will make extreme weather events like heatwaves, more frequent and more severe, disproportionately affecting minorities and indigenous peoples. Climate change is also acutely impacting Federal public lands and resources.

iii. Climate change is caused primarily by GHG emissions from fossil fuel use, with public lands playing a key role.

The contribution of Federal lands mineral production to the climate change problem is significant. The U.S. Federal Government is one of the largest energy asset managers in the world – responsible for over 2.4 billion acres of subsurface mineral rights, including resources like coal, crude oil, and natural gas. The Federal government does not regularly track climate emissions associated with fossil energy development on public lands, nor has it ever set reduction goals for these emissions. 2018 and 2020 reports by The Wilderness Society (attached as Exhibits 2 & 3) provide an in-depth look at the significant lifecycle emissions resulting from the development of fossil fuels on U.S. public lands. These reports found that in 2017, Federal lands supplied 42% of all coal, 24% of all crude oil, and 13% of all-natural gas produced in the United States. Over the last decade, the lifecycle emissions associated with these publicly owned fossil fuel resources amounted to approximately 20% of all U.S. GHG emissions.

To put this in perspective, if Federal public lands were a country, they would be the fifth-largest emitter of GHGs in the world. The Wilderness Society researchers found that development of oil and gas leases sold at auction between January 2017 and January 2020 could result in lifecycle emissions between 1 billion and 5.95 billion metric tons (MT) carbon dioxide-equivalent (CO_2e).[18] Of these potential emissions, onshore leasing during this period accounts for roughly 62% of total estimated emissions (3.68 billion MT CO_2e), while offshore leasing accounts for 38% (2.27 billion MT CO_2e).[19] In order to stay under the 2°C limit supported by leading scientists, emissions associated with Federal lands energy development need to be reduced from 1.52 billion tons carbon dioxide equivalent (CO_2e) per year to between 1.16 billion and 1.13 billion tons CO_2e per year by 2025 to be in-line with economy-wide reductions.[20] The analysis concludes that CO_2e emissions

[15] *Id.* at 2.
[16] Alana Hansen et al., *Vulnerability to extreme heat and climate change: is ethnicity a factor*? 6 GLOBAL HEALTH ACTION 21,364 (2013), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3728476/.
[17] Jeremy Hoffman et al., *The Effects of Historical Housing Policies on Resident Exposure to Intra-Urban Heat: A Study of 108 US Urban Areas* (2020), https://www.mdpi.com/2225-1154/8/1/12/htm.
[18] THE WILDERNESS SOCIETY, THE CLIMATE REPORT 2020: GREENHOUSE GAS EMISSIONS FROM PUBLIC LANDS AT 6 (2020), https://www.wilderness.org/sites/default/files/media/file/TWS_The%20Climate%20Report%202020_Greenhouse%20Gas%20Emissions%20from%20Public%20Lands.pdf.
[19] *Id*. at 6.
[20] THE WILDERNESS SOCIETY, IN THE DARK; THE HIDDEN CLIMATE IMPACTS OF ENERGY DEVELOPMENT ON PUBLIC LANDS 3 (2018), https://www.wilderness.org/sites/default/files/media/file/In the Dark

from Federal lands is on pace to exceed these targets by roughly 300 million tons or 25%. The Federal government has failed to provide adequate policies to address emissions stemming from public lands. BLM must seriously consider how its management of energy development on our public lands is a critical component of any national emissions reduction strategy.

Government reports confirm these findings. A 2018 U.S. Geological Survey (USGS) report, *Federal Lands Greenhouse Gas Emissions and Sequestration in the United States: Estimates for 2005-14*, found that GHG emissions from Federal energy production on public lands are a significant source of total U.S. emissions.[21] Nationwide emissions from fossil fuels produced on Federal lands in 28 States and two offshore areas in 2014 were 1,279.0 million metric tons of carbon dioxide equivalent (MMT CO_2e) for carbon dioxide (CO2), 47.6 MMT CO2 Eq. for methane (CH4), and 5.5 MMT CO_2e for nitrous oxide (N2O).[22] The 2018 USGS analysis referenced above found that:

> [n]ationwide emissions from [fossil] fuels extracted from Federal lands in 2014 were 1,279.0 MMT CO_2 Eq. [million metric tons of carbon dioxide equivalent] for CO_2 [carbon dioxide], 47.6 MMT CO_2 Eq. for CH_4 [methane], and 5.5 MMT CO_2 Eq. for N_2O [nitrous oxide]. . . . On average, Federal lands fuels emissions . . . accounted for 23.7 percent of national CO_2 emissions, 7.3 percent for CH_4, and 1.5 percent for N_2O [over the ten years included in this estimate].[23]

In short, the best available scientific information demonstrates that we cannot continue to lease, develop, and burn fossil fuels at current rates and must move rapidly to a net-zero carbon budget from public lands.[24] Despite this information, the Trump Administration has offered up 24.5 million acres of publicly owned land and minerals to oil and gas companies as of March 2020. This is greater than the size of Indiana. Off our coasts, the Administration has offered 359,537,572 acres of publicly owned waters to oil and gas companies. Our last remaining wild places are under tremendous threat from pressures for oil, gas, and mineral extraction on public lands. Americans depend on these unique wild lands for their way of life. Energy companies already have more leases than they can use — of the 25.5 million acres currently under lease to oil and gas companies, nearly half are sitting idle.[25] The production horizons for already leased federal fossil fuel resources underscore how unwarranted any additional leasing is, and in turn how unreasonable new leasing is.

Comparing production horizons to dates at which carbon budgets would be exceeded if current emission levels continue demonstrates the critical need for the Federal government to immediately

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Report_FINAL_Feb_2018.pdf.

[21] *See* MATTHEW D. MERRILL, ET AL., FEDERAL LANDS GREENHOUSE EMISSIONS AND SEQUESTRATION IN THE UNITED STATES—ESTIMATES FOR 2005–14, U.S. GEOLOGICAL SURVEY SCIENTIFIC INVESTIGATIONS REPORT 1 (2018), https://doi.org/10.3133/sir20185131. [hereinafter USGS Report]

[22] *Id.* at 1.

[23] *Id.* at 6.

[24] DUSTIN MULVANEY, ET AL. OVER-LEASED: HOW PRODUCTION HORIZONS OF ALREADY LEASED FEDERAL FOSSIL FUELS OUTLAST GLOBAL CARBON BUDGETS 5 (2016), https://1bps6437gg8c169i0y1drtgz-wpengine.netdna-ssl.com/wp-content/uploads/wpallimport/files/archive/Over_Leased_Report_EcoShift.pdf. [hereinafter Over-Leased].

[25] BLM Oil and Gas Statistics webpage, Table 2 and Table 6. https://www.blm.gov/programs/energy-and-minerals/oil-and-gas/oil-and-gas-statistics

acknowledge the climate impacts of development on public lands. For example:

- Federal crude oil already leased will continue producing for 34 years beyond the 1.5°C threshold and 19 years beyond the 2°C threshold;
- Federal natural gas already leased will continue producing 23 years beyond the 1.5°C threshold and 8 years beyond the 2°C threshold;
- Federal coal already leased will continue producing 20 years beyond the 1.5°C threshold and 5 years beyond the 2°C threshold.[26]

Choosing not to lease oil and gas parcels could be a very significant part of U.S. efforts to address climate change. If new leasing ceases and existing non-producing leases are not renewed, 12% of oil production could be avoided in 2025 and 65% could be avoided by 2040, while 6% of natural gas production could be avoided in 2025 and 59% could be avoided by 2040.[27] This avoided production would significantly reduce future U.S. emissions. Cessation of new and renewed leases for federal fossil fuel extraction could reduce CO2 emissions by about 100 Mt per year by 2030.[28]

BLM could also address the anticipated GHG emissions from new leasing through mitigation to ensure net-zero carbon emissions from public lands, as discussed further below. While net-zero emissions should be achieved by 2030 to avoid the most catastrophic impacts of climate change, they absolutely must be achieved by 2050, with at least a 45% reduction in emissions by 2030. As described in the IPCC's 2018 Special Report, "Limiting warming to 1.5°C implies reaching net zero CO_2 emissions globally around 2050 and concurrent deep reductions in emissions of non-CO_2 forcers, particularly methane."[29] "In model pathways with no or limited overshoot of 1.5°C, global net anthropogenic CO_2 emissions decline by about 45% from 2010 levels by 2030 (40–60% interquartile range), reaching net-zero around 2050 (2045–2055 interquartile range)."[30] Despite the crucial need to rapidly decrease and eliminate GHG emissions from public lands, the Trump Administration has worked to dismantle policies designed to reduce emissions.

Despite the crucial need to rapidly decrease and eliminate GHG emissions from public lands, the Trump Administration has worked to dismantle policies designed to reduce emissions.

[26] DUSTIN MULVANEY, ET AL. OVER-LEASED: HOW PRODUCTION HORIZONS OF ALREADY LEASED FEDERAL FOSSIL FUELS OUTLAST GLOBAL CARBON BUDGETS 5 (2016), https://1bps6437gg8c169i0y1drtgz-wpengine.netdna-ssl.com/wp-content/uploads/wpallimport/files/archive/Over_Leased_Report_EcoShift.pdf. [hereinafter Over-Leased].
[27] PETER ERICKSON & MICHAEL LAZARUS, *HOW WOULD PHASING OUT U.S. FEDERAL LEASES FOR FOSSIL FUEL EXTRACTION AFFECT CO2 EMISSIONS AND 2°C GOALS?*, STOCKHOLM ENVIRONMENTAL INSTITUTE 16 (2016), https://mediamanager.sei.org/documents/Publications/Climate/SEI-WP-2016-02-US-fossilfuel-leases.pdf.
[28] Over-Leased, *supra* note 15, at 6.
[29] Rogelj, J., D. Shindell, K. Jiang, S. Fifita, P. Forster, V. Ginzburg, C. Handa, H. Kheshgi, S. Kobayashi, E. Kriegler, L. Mundaca, R. Séférian, and M.V.Vilariño, 2018: Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press. *Executive Summary*
[30] *Id.*

Under the Obama Administration BLM adopted the 2016 Methane (or Waste) Rule that had important climate implications. *See* Waste Prevention, Production Subject to Royalties, and Resource Conservation, 81 Fed. Reg. 83,008 (Nov. 18, 2016). The Methane Rule put in place strong new regulations to reduce venting, flaring, and leaking of natural gas (methane), an extremely potent greenhouse gas. Pursuant to a March 2017 Executive Order (EO 13783) and related Interior Department Secretarial Order (SO 3349), the Trump Administration has rescinded the rule. *See* Waste Prevention, Production Subject to Royalties, and Resource Conservation; Rescission or Revision of Certain Requirements, 83 Fed. Reg. 49,184 (Sept. 28, 2018). The rescission is currently being challenged in court. *State of California v Bernhardt,* Case No. 4:18 cv 05712 YGR (N.D. Calif.) (Methane Rule).

BLM's environmental analysis must also consider that undeveloped Federal lands act as a critical carbon sink. The USGS found that in 2014, Federal lands of the conterminous United States stored an estimated 83,600 MMT CO_2 Eq., in soils (63%), live vegetation (26%), and dead organic matter (10%).[31] In addition, the USGS estimated that Federal lands "sequestered an average of 195 MMT CO_2 Eq./yr between 2005 and 2014, offsetting approximately 15% of the CO_2 emissions resulting from the extraction of fossil fuels on Federal lands and their end-use combustion."[32] BLM must account for potential loss of carbon storage in its leasing decisions, including analysis of how the decisions and resulting fossil fuel development will increase negative climate impacts. The agency's analysis should include consideration of the time lag between leasing and reclamation and the significance of the loss of carbon sinks on GHG emissions and climate change during that time period.

Utah State University (USU) studied the impacts of climate change on the multiple uses that BLM is charged with managing and made recommendations for how the agency should be addressing this issue in its land management planning and other decisions. Attached as Exhibit 4. The study reviewed 225 papers published between 2009 and 2018, and found that active uses on BLM lands, such as energy development, threaten passive uses such as conservation and ecosystem services. Under FLPMA, BLM is required to manage the public lands based on the principles of multiple use and sustained yield. Yet, in reviewing 44 BLM RMPs, the study found that there was little consideration of climate change impacts to ecosystems and land uses and that adaptive responses to climate change were not considered. BLM must plan for climate change to fulfill its conservation mandate, especially the need for prioritizing different uses, but BLM's planning remains inadequate. Passive uses are under-prioritized by BLM in favor of active uses. Energy extraction contributes the most to anthropogenic climate change of all the land uses BLM manages. Consequently, the study concluded the most direct way the BLM can reduce its contribution to climate change is by reducing permits for energy extraction. The widespread lack of consideration of climate change in BLM management plans negatively impacts BLM's multiple use mandate. More thorough incorporation of science is needed for effective natural resources management in the face of a climate-change affected future. BLM should consider the USU report as it analyzes, and addresses climate impacts associated with the Nevada June 2020 lease sale.

[31] USGS Report, *supra* note 13, at 12-13.
[32] *Id.* at 1.

4. BLM must fully analyze the impacts of climate change for this lease sale under NEPA

The National Environmental Policy Act (NEPA) is our "basic national charter for the protection of the environment." 40 C.F.R. § 1500.1(a). It achieves its purpose through "action forcing" procedures. *Id.* §§ 1500.1(a), 1502.1. The courts have termed this crucial evaluation as a "hard look." *Ocean Advocates v. U.S. Army Corps of Engineers*, 402 F.3d 846, 864 (9th Cir. 2005). NEPA's fundamental purpose is to ensure "important effects will not be overlooked or underestimated." *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349 (1989). NEPA requires BLM to consider national policy in its decision-making process. 40 C.F.R. §§ 1500.6, 1502.16(c), 1506.2(d).[33] This includes the consideration of the best available information and data, as well as disclosure of any inconsistencies with federal policies and plans. *Id.* §§ 1502.22, 1502.24.

Recognizing that "each person should enjoy a healthful environment," NEPA ensures that the Federal government uses all practicable means to "assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings," and to "attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences." 42 U.S.C. §§ 4331(b)–(c). Agencies "to the fullest extent possible" are to achieve the policies of NEPA, which include:

- Using a systematic and interdisciplinary approach in planning and decision-making that may have an impact on man's environment;
- Considering presently unquantified environmental amenities and values in decision-making;
- Recognizing the worldwide and long-range character of environmental problems; and;
- Initiating and using ecological information in planning and the development of resource-oriented projects.

Id. §§ 4332(1)A), (B), (F), (H).

It is well established that Federal agencies must analyze climate change when conducting land use planning, including in this lease sale EA. *See, e.g.*, *Wilderness Workshop v. Bureau of Land Mgmt.*, 342 F. Supp. 3d 1145, 1156 (D. Colo. 2018) (holding BLM failed to take a hard look at the severity and impacts of GHG pollution, specifically the indirect impacts of oil and gas combustion, in an RMP revision); *W. Org. of Res. Councils v. Bureau of Land Mgmt.*, 2018 U.S. Dist. LEXIS 49635 at 53-54 (D. Mont., Mar. 26, 2018) (holding BLM needed to consider climate change impacts relative to the amount of coal available for leasing, consider the downstream combustion of coal, oil, and gas open to development, and consider a 20-year global warming potential rather than 100-year).

NEPA requires a more searching analysis than merely disclosing the amount of GHG pollution.

[33] NEPA regulations direct federal agencies to "discuss any inconsistency of a proposed action with any approved State or local plan and laws (whether or not federally sanctioned)," 40 C.F.R. § 1506.2(d), and require agencies to address "[p]ossible conflicts between the proposed action and the objectives of Federal, regional, State, and local (and in the case of a reservation, Indian tribe) land use plans, policies and controls for the area concerned." 40 C.F.R. § 1502.16(c).

BLM must examine the "ecological[,] . . . economic, [and] social" impacts of those emissions, including an assessment of their "significance." 40 C.F.R. §§ 1508.8(b), 1502.16(a)–(b). BLM must also consider unquantified effects, recognize the worldwide and long-range character of climate change impacts, and incorporate this analysis of ecological information into its environmental analysis. 42 U.S.C. §§ 4332(2)(B), (F), (H).

Federal courts have repeatedly rejected agency claims that analysis at the lease sale stage would be speculative. "Because speculation is implicit in NEPA, we must reject any attempt by agencies to shirk their responsibilities under NEPA labeling any and all discussion of future environmental effects as crystal ball inquiry." *Northern Plains Res. Council, Inc. v. Surface Transportation Bd.*, 668 F.3d 1067, 1078–79 (9th Cir. 2011) (quotations and alternations omitted) (rejecting agency's argument that coalbed methane drilling was "too speculative" to analyze).

The Tenth Circuit Court of Appeals recently held that the preparation of a Reasonably Foreseeable Development Scenario (RFDS) makes it reasonably foreseeable that the number of wells identified "*would be drilled*," and NEPA, therefore, requires BLM to consider impacts of those wells in its lease sale NEPA analysis. *Diné Citizens Against Ruining Our Env't v. Bernhardt*, 923 F.3d 831, 853 (10th Cir. 2019) (emphasis added). While the EA includes an RFDS, BLM fails to complete the necessary analysis under NEPA.

To comply with NEPA, BLM must at a minimum conduct NEPA analysis for this lease sale to include the following components:

- Complete an environmental assessment (EA) or environmental impact statement (EIS) to fully analyze climate change impacts and mitigation opportunities. This analysis must include, among other things, methane emissions, social cost of greenhouse gases, including carbon and methane, and loss of carbon sequestration.
- Quantify reasonably foreseeable GHG emissions – including end-use of fossil fuel extraction (downstream emissions) – and associated direct, indirect, and cumulative climate impacts associated with those emissions.
- Develop alternatives that allow the public and the decisionmaker to compare the anticipated levels of GHG emissions, including alternatives that close all lands to leasing or only make limited lands available for leasing, as well as other alternatives that ensure a net zero carbon budget.
- Analyze options to avoid, minimize, and fully mitigate GHG emissions, and energy development in the planning area (e.g., prioritize minimal development, but for where development does occur, do not open low-potential lands to leasing and assess the option value of delaying leasing.
- Establish a requirement for a lease notice to be attached to proposed leases to preserve BLM's ability to impose mitigation or offsets for climate change impacts at the application for permit to drill (APD) stage, or to delay/disapprove development.

An agency must "consider every significant aspect of the environmental impact of a proposed action." *Baltimore Gas & Electric Co. v. Natural Resources Defense Council*, 462 U.S. 87, 107 (1983) (quotations and citation omitted). This includes the disclosure of direct, indirect, and cumulative impacts of its actions, including climate change impacts and emissions. 40 C.F.R. §§

1502.16(a)–(b), 1508.25(c).

The need to evaluate such impacts is bolstered by the fact that "[t]he harms associated with climate change are serious and well recognized," and environmental changes caused by climate change "have already inflicted significant harms" to many resources around the globe. *Massachusetts v. EPA*, 549 U.S. 497, 521 (2007); *see also id.* at 525 (recognizing "the enormity of the potential consequences associated with manmade climate change"). Among other things, the agency's NEPA analysis must disclose "the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity[,]" including the "[e]nergy requirements and conservation potential of various alternatives and mitigation measures." 42 U.S.C. § 4332(2)(C)(iv); 40 C.F.R. § 1502.16(e). Failing to perform such analysis undermines the agency's decision-making process and the assumptions made. Furthermore, the RFD in BLM Nevada's June 2020 lease sale is identical to the RFD and subsequent analysis on climate change impacts from the previous March 2020 lease sale, despite the lease sale being 556% larger in acreage.

i. Case law confirms BLM's obligation under NEPA to fully analyze climate impacts.

Federal courts have repeatedly confirmed that the BLM must consider climate change in its NEPA analysis of oil and gas lease sales. For instance, in *WildEarth Guardians* the court found that in issuing 282 leases in Wyoming, BLM "did not take a hard look at drilling-related and downstream GHG emissions from the leased parcels, and it failed to sufficiently compare those emissions to regional and national emissions." 368 F. Supp. 3d at 63. On that basis the court remanded the EAs and FONSIs to BLM for further analysis and enjoined BLM from issuing any APDs on the leases. *Id.* at 79–80. The court stated:

> In summary, the challenged EAs failed to take a hard look at the climate change impacts of oil and gas drilling because the EAs (1) failed to quantify and forecast drilling related GHG emissions; (2) failed to adequately consider GHG emissions from the downstream use of oil and gas produced on the leased parcels; and (3) failed to compare those GHG emissions to state, regional, and national GHG emissions forecasts, and other foreseeable regional and national BLM projects.

Id. at 76–77. "By asserting that these crucial environmental analyses are overly speculative at the leasing stage and more appropriate for later site-specific assessments, BLM risks relegating the analyses to the 'tyranny of small decisions.'" *Id.* at 77 (citation omitted).[34] These obligations hold true at the RMP stage as well. *See, e.g.*, *Wilderness Workshop v. BLM*, 342 F. Supp. 3d 1145, 1155–56 (D. Colo. 2018) (holding that BLM violated NEPA by not considering downstream indirect effects of emissions resulting from combustion of oil and gas and failed to analyze alternatives that would have made low-potential lands unavailable for leasing).

Federal courts have echoed these requirements in the coal leasing context – at both the leasing and RMP stages. *See, e.g., W. Org. of Res. Councils v. BLM,* CV16-21-GF-BMM, 2018 WL 1475470,

[34] *See also, San Juan Citizens Alliance v. BLM,* 326 F. Supp. 3d 1227, 1244, 1249 (D.N.M. 2018) (invalidating lease sale where BLM failed to analyze downstream combustion and associated indirect impacts and admonishing the agency not to utilize outdated scientific tools and analyses).

at *29, 40, 53–54 (D. Mont. Mar. 26, 2018) (BLM failed to analyze downstream combustion impacts associated with lands made available for coal leasing in the RMP or to consider options that modified or foreclosed the amount of acreage available); *High Country Conservation Advocates v. U.S. Forest Service*, 52 F. Supp. 3d 1174, 1189–92, 1196–98 (D. Colo. 2014) (Forest Service failed to adequately analyze climate impacts of coal mine expansion, including subsequent combustion of the coal, or to utilize available tools such as the Social Cost of Carbon to quantify costs). The BLM must fully consider this case law as it prepares the NEPA analysis for this lease sale.

ii. BLM must fully analyze the direct, indirect, and cumulative impacts of GHG emissions.

NEPA requires full analysis of the direct, indirect, and cumulative climate impacts of reasonably foreseeable GHG emissions associated with the lease sale. 40 C.F.R. §§ 1502.16(a)-(b), 1508.25(c). In analyzing these impacts, the BLM needs to ensure it considers the full scope of development activities that are reasonably foreseeable under a BLM oil and gas lease: exploration, drilling, well completion (including hydraulic fracturing), production, gathering, boosting, processing, transportation, transmission, storage, distribution, refining, and end use.

Failure to fully analyze and disclose to the public the impacts of the leasing decision on GHG emissions and climate change violates NEPA. Lease issuance is the "point of no return" (*i.e.*, the point at which time BLM makes an irrevocable commitment of resources) for purposes of NEPA analysis. *WildEarth Guardians*, 368 F. Supp. 3d at 66. BLM itself identifies lease issuance as the point of irretrievable commitment of resources:

> The BLM has a statutory responsibility under NEPA to analyze and document the direct, indirect and cumulative impacts of past, present and reasonably foreseeable future actions resulting from Federally authorized fluid minerals activities. By law, these impacts must be analyzed before the agency makes an irreversible commitment. In the fluid minerals program, this commitment occurs at the point of lease issuance.[35]

It is at this point that BLM must analyze *all* direct, indirect, and cumulative impacts of its leasing decision. *See, e.g.*, *WildEarth Guardians*, 368 F. Supp. 3d at 65–66; *see also* 40 C.F.R. §§ 1508.7, 1508.8.

The BLM must ensure in its NEPA analysis for this lease sale that it considers the amount of GHG emissions likely to be generated as a result of well drilling on the leases that are sold, as well as the impacts of those emissions. In doing its assessment of direct, indirect, and cumulative impacts, BLM must communicate the "actual environmental effects resulting from . . . emissions" of GHGs, not just quantify them. *Ctr. for Biological Diversity v. National Highway Transportation Safety Administration.*, 538 F.3d 1172, 1216 (9th Cir 2008).[36]

[35] Bureau of Land Management., *H-1624-1 – Planning for Fluid Mineral Resources* § I.B.2, at I–2 (Feb. 20, 2018) (emphasis added), *available at* https://www.blm.gov/sites/blm.gov/files/H-1624-1%20rel%201-1791.pdf.

[36] In assessing direct, indirect, and cumulative impacts, BLM must use the best available science by analyzing the warming potential of methane emissions using both the IPCC's current upper-end 100-year global warming potential (GWP) for fossil methane of 36, and the IPCC's current upper-end 20-year GWP for fossil methane of 87. *See W. Org. of Res. Councils v. U.S. Bureau of Land Mgmt.*, CV16-21-GF-BMM, 2018 WL 1475470, at *18 (D.

The indirect impacts of oil and gas leasing on GHG emissions (i.e., downstream emissions) must be considered in BLM's NEPA analysis, as repeatedly emphasized by the courts. *See San Juan Citizens Alliance*, 326 F. Supp. 3d at 1240–50 (BLM's reasoning for not analyzing indirect GHG emissions was "contrary to the reasoning in several persuasive cases that have determined that combustion emissions are an indirect effect"); *W. Org. of Res. Councils*, CV16-21-GF-BMM, 2018 WL 1475470, at *40. ("In light of the degree of foreseeability and specificity of information available to the agency while completing the EIS, NEPA requires BLM to consider in the EIS the environmental consequences of the downstream combustion of the coal, oil and gas resources potentially open to development under these RMPs."); *Wilderness Workshop*, 342 F. Supp. 3d at 1156) ("BLM acted in an arbitrary and capricious manner and violated NEPA by not taking a hard look at the indirect effects resulting from the combustion of oil and gas in the planning area under the RMP. BLM must quantify and reanalyze the indirect effects that emissions resulting from combustion of oil and gas in the plan area may have on GHG emissions."); *Sierra Club v. Fed. Energy Regulatory Comm'n*, 867 F.3d 1357, 1374 (D.C. Cir. 2017) (stating that GHG emissions from the combustion of gas "are an indirect effect of authorizing this [pipeline] project, which [the agency] could reasonably foresee"); *Mont. Envtl. Info. Ctr. v. U.S. Office of Surface Mining Reclamation and Enf't*, 274 F. Supp. 3d 1074, 1098-99 (D. Mont. 2017) (stating that indirect effects from coal trains include "the effects of the estimated 23.16 million metric tons of [GHG] emissions the Mining Plan EA concluded would result from combustion of the coal that would be extracted from the mine"); *Diné Citizens*, 82 F. Supp. 3d at 1213 ("find[ing] that the coal combustion-related impacts of [the mine's] proposed expansion are an 'indirect effect' requiring NEPA analysis").

BLM is obligated under NEPA to analyze the cumulative impacts on the climate of the past, present, and reasonably foreseeable oil and gas development in the project area. NEPA requires a detailed analysis of cumulative effects, which are "the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions." 40 C.F.R. §§ 1508.7, 1508.25(c). Analysis of cumulative impacts protects against "the tyranny of small decisions," *Kern v. BLM*, 284 F.3d 1062, 1078 (9th Cir. 2002), by confronting the possibility that agency action may contribute to cumulatively significant effects even where impacts appear insignificant in isolation. 40 C.F.R. §§ 1508.7. BLM must consider the reasonably foreseeable incremental and total contribution of GHG emissions from oil and gas development in the planning area when added to other relevant past, present, and reasonably foreseeable BLM-managed fossil-fuel extraction emissions as well as GHG emissions from non-federal sources.

The need to consider cumulative impacts has been confirmed by the courts. In *Ctr. for Biological Diversity*, the Ninth Circuit assessed an agency's NEPA analysis for a rule requiring automobile manufacturers to increase the fuel efficiency of their vehicles, thereby lowering average tailpipe emissions per mile driven. 538 F.3d 1172. The court stated that "[t]he impact of greenhouse gas emissions on climate change is precisely the kind of cumulative impacts analysis that NEPA requires agencies to conduct." *Id.* at 1217. There was a need to consider the broader range of impacts, not just the impacts of the action alone. *Id.* Likewise, in *Mid States Coalition for Progress*

Mont. Mar. 26, 2018).("BLM violated NEPA where it failed to justify its use of GWPs based on a 100-year time horizon rather than the 20-year time horizon of the RMPs. BLM also violated NEPA where it failed to acknowledge evolving science in this area . . ." that would justify a lower GWP).

v. Surface Transp. Bd., the Eighth Circuit held that NEPA requires an agency to disclose and analyze the impacts of future combustion of mined coal when deciding whether to approve a railroad line providing access to coal mining areas. 345 F.3d 520, 549–50 (8th Cir. 2003).

As stated in *WildEarth Guardians*, relating to an insufficient cumulative impacts analysis for oil and gas leasing in Wyoming:

> Without access to a data-driven comparison of GHG emissions from the leased parcels to regional and national GHG emissions, the public and agency decisionmakers had no *context* for the EAs' conclusions that GHG emissions from the leased parcels would represent only an "incremental" contribution to climate change. Likewise, they could not *conceptualize* the extent to which the lease sales would contribute to the local, regional, and global climate change discussed qualitatively in the EAs and tiered EISs.

368 F. Supp. 3d at 77. (emphasis added).

To satisfy NEPA's hard look requirement, the cumulative impacts assessment must do two things. First, BLM must catalog the past, present, and reasonably foreseeable projects in the area that might impact the environment. *Muckleshoot Indian Tribe v. U.S. Forest Service*, 177 F.3d 800, 809–10 (9th Cir. 1999). Second, BLM must analyze these impacts in light of the proposed action. *Id.* If BLM determines that certain actions are not relevant to the cumulative impacts analysis, it must "demonstrat[e] the scientific basis for this assertion." *Sierra Club v. Bosworth*, 199 F. Supp. 2d 971, 983 (N.D. Cal. 2002).

A failure to include a cumulative impact analysis of additional leasing that is already planned in the region renders a NEPA analysis insufficient. *See*, *e.g.*, *Kern*, 284 F.3d at 1078 (holding that an EA for a timber sale must analyze the reasonably foreseeable future timber sales within the area). The analysis here must include an analysis of the extent of past oil and gas leasing in the area, how this past leasing may have contributed to significant environmental impacts, and whether additional leasing may have an "additive and significant relationship to those effects." Council on Environmental Quality, Guidance on the Consideration of Past Actions in Cumulative Effects Analysis at 1 (June 24, 2005); *Lands Council v. Powell*, 395 F.3d 1019, 1028 (9th Cir. 2005).

BLM must ensure it fully considers not only the GHG emissions from wells drilled on the leases sold at this lease sale—and the climate change impacts of those GHG emissions—but also the impacts of other federal lease sales in the state, the region, and the nation, as well as impacts from GHG emissions from non-Federal sources. BLM must consider GHG emissions in the aggregate along with other foreseeable emissions. This is necessary to meet the cumulative impacts analysis requirements of NEPA.

While the EA considers the direct, indirect, and cumulative impacts of GHG emissions that could result from this lease sale in the EA, it declines to consider the climate change impacts of these emissions, claiming leasing does not cause direct or cumulative air quality impacts. EA at 23, 51. It says uncertainty prevents an estimate of climate change impacts, claiming leasing is just an administrative action with no direct impacts. *Id.* at 27. It would unlawfully defer impact analysis to the APD stage of development. *Id.* at 23. The BLM says downstream (indirect) GHG emissions

estimates can be made but climate change impacts due to those emissions cannot be. *Id.* at 26. The BLM says GHG emissions estimates can be used as a proxy from climate change impacts analysis, citing Council on Environmental Quality draft guidance. *Id.* at 52. However, this draft guidance cannot supersede what is required by statute. The BLM must fully analyze and disclose to the public of the direct, indirect, and cumulative effects of GHG emissions on climate change to comply with NEPA.

iii. BLM must consider the ecological, economic, and social impacts of GHG emissions utilizing best available science and information.

BLM's analysis must consider ecological, aesthetic, historical, cultural, economic, and social effects whether the impacts are direct, indirect, or cumulative. 40 C.F.R. § 1508.8(b). BLM's NEPA analysis must ensure the scientific integrity of the discussions and analyses, particularly on GHG emissions and climate change. *Id.* § 1502.24. To meet these requirements, there are several protocols and analyses available that should be reflected in the NEPA analysis.

a. BLM should employ the social cost of carbon and social cost of methane protocols.

The Social Cost of Carbon (SCC) is a leading tool for quantifying the climate impacts of proposed federal actions.[37] It is an estimate, in dollars, of the long-term damage caused by a one-ton increase in carbon dioxide (CO2) emissions in a given year; or viewed another way, the benefits of reducing CO2 emissions by that amount in a given year. The SCC is intended to be a comprehensive estimate of climate change damages that includes, among other costs, the changes in net agricultural productivity, risks to human health, and property damages from increased flood risks. A court has recognized its applicability to NEPA analyses. *High Country Conservation Advocates*, 52 F. Supp. 3d at 1190–93 (determining that the U.S. Forest Service's decision to not employ SCC was arbitrary and capricious and violated NEPA). By ignoring the need to accurately quantify the costs of climate change, BLM is essentially zeroing out the potential costs of development that could occur under the proposed action. Courts do not allow such an approach under NEPA. *Id.* To the extent that the BLM does not use the SCC, the agency must still find a way to calculate these costs.

Similarly, the Social Cost of Methane is another available tool that BLM could use in its NEPA analysis to analyze and disclose the significance of impacts of its decisions as required by 40 C.F.R. §§ 1508.8(b), 1502.16(a)-(b).[38] Both tools should be utilized here.

[37] Interagency Working Group on Social Cost of Carbon, *United States Government, Technical Support Document: - Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866* at 2 (Aug. 2016 revision). Although President Trump directed the Office of Information and Regulatory Affairs to withdraw this metric in Executive Order 13,783 (82 Fed. Reg. 16,093 (Mar. 28, 2017)), it remains the best available tool for complying with the legal requirement to analyze the effects of GHG emissions.

[38] Interagency Working Group on Social Cost of Greenhouse Gases (IWG), *Addendum to Technical Support Document on Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866: Application of the Methodology to Estimate the Social Cost of Methane and the Social Cost of Nitrous Oxide* 2-3 (2016), *available* at: https://www.epa.gov/sites/production/files/2016-12/documents/addendum_to_sc-ghg_tsd_august_2016.pdf.

b. BLM should utilize global carbon budgets.

A carbon budget sets a cap on the remaining GHG that can be emitted while keeping global average temperature rise below scientifically researched warming thresholds (2°C or 1.5°C). BLM should consider a carbon budget in this EA and disclose what portion of the remaining budget the lease sale's cumulative emissions will consume. Like the social cost of GHGs, a carbon budget "disclose[s] the actual environmental effects" of the project in a way that "brings those effects to bear on [the agency's] decisions." *See Baltimore Gas & Electric Co.*, 462 U.S. 87 at 96. BLM should utilize a carbon budget so that the climate change NEPA analysis is based on the best available science, as required by the NEPA regulations. 40 C.F.R. § 1502.24.

To ensure the scientific integrity of this NEPA analysis, BLM should use available tools, such as the social cost of greenhouse gases (carbon and methane) and carbon budgeting analyses. *See* 43 C.F.R. § 1502.24 ("Agencies shall insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements.").

BLM has failed to disclose the significance of emissions and should utilize both the social cost of GHGs and carbon budgeting to do so.

iv. Climate change impacts must be integrated into the environmental baseline and across alternatives.

Considerations of existing and reasonably foreseeable climate change impacts must be integrated into the environmental baseline and across alternatives, including the no action alternative, in order to facilitate the requisite hard look at impacts that NEPA requires. Agencies are required under NEPA to "describe the environment of the area(s) to be affected or created by the alternatives under consideration," which creates the "baseline" for the impacts analysis and comparison of alternatives. 40 C.F.R. § 1502.15. As the Ninth Circuit held, "without establishing the baseline conditions . . . there is simply no way to determine what effect the proposed [action] will have on the environment and, consequently, no way to comply with NEPA." *Half Moon Bay Fisherman's Marketing Ass'n v. Carlucci*, 857 F.2d 505, 510 (9th Cir. 1988). The court further held that "[t]he concept of a baseline against which to compare predictions of the effects of the proposed action and reasonable alternatives is critical to the NEPA process." Excluding climate change effects from the environmental baseline ignores the reality that the impacts of proposed actions must be evaluated based on the already deteriorating, climate-impacted state of the resources, ecosystems, human communities, and structures that will be affected.

The underlying RMP is drastically out of date and in need of revision. This thirty-year old RMP (the 1986 Shoshone-Eureka RMP) cannot be used to inform the baseline conditions in the area. After 20 plus years it is impossible for the BLM to credibly claim that these same lands would be available for leasing under the same conditions if a new, updated RMP was developed. Until these problems are corrected in an updated environmental impact statement (EIS) and/or RMP, the current RMP cannot be used to support the June 2020 lease sale.

Similarly, it is important for BLM to consider the "context" of climate change problems. This includes "society as whole (human, national), the affected region, the affected interests, and the

locality." 40 C.F.R. § 1508.27(a). "Both short- and long-term effects are relevant." *Id.; see also* 42 U.S.C. § 4332(2)(F) (requiring agencies to "recognize the worldwide and long-range character of environmental problems"). The world as a whole must be considered in a NEPA climate change analysis. *See Montana Envtl. Info. Ctr.*, 274 F. Supp. 3d at 1101–02 (for greenhouse gases, an agency may not "limit its context analysis to the local and regional level"); *accord Barnes v. U.S. Dep't of Transp.*, 655 F.3d 1124, 1139 (9th Cir. 2011) (noting "the effect of greenhouse gases on climate is a *global* problem" (emphasis in original)). Thus, in setting the "context" for this EA analysis, BLM must consider the local environment where the lease parcels are located, as well as regional, national, and global climate impacts.

v. BLM must fully consider measures to mitigate climate impacts.

NEPA and associated CEQ regulations require BLM to analyze potential impacts and consider ways to avoid, minimize and mitigate impacts, in accordance with the mitigation hierarchy. 40 C.F.R. §§ 1508.8, 1502.14, 1502.16, 1508.20. Specifically, agencies must "include appropriate mitigation measures not already included in the proposed action or alternatives." *Id.* §§ 1502.14(f), 1502.16(h). In its environmental analysis to support this lease sale, BLM must consider "[e]nergy requirements and conservation potential of various alternatives and mitigation measures" and means to mitigate adverse environmental impacts. *Id.* §§ 1502.16(e), (h).

BLM must first seek to avoid impacts, with second priority to minimize impacts (e.g., through project modifications, permit conditions, interim and final reclamation, etc.), and, generally, only if those approaches are insufficient to fully mitigate the impacts, will BLM seek to require compensation for some or all of the remaining impacts (i.e., residual effects). Tools such as regional mitigation strategies, compensatory mitigation funds, and conservation agreements allow land managers, in partnership with developers and stakeholders, to prioritize areas for different uses based on the full range of trust resources present and determine whether avoidance, minimization, or compensation of development impacts is appropriate in specific contexts and locations. This decisional hierarchy protects the other uses of public land – including hunting, fishing, and outdoor recreation – and gives industry better information to plan their investments and a more predictable and efficient permitting process.

Simply stating that climate change is occurring and the proposed action would contribute to its effects is inadequate; BLM must utilize that analysis to evaluate and ultimately adopt decisions that lessen or eliminate those impacts, such as closing areas to leasing, not leasing in areas with low or no development potential, requiring emissions mitigation technologies for future leases, and/or requiring inclusion of lease notices and stipulations for future leases to preserve the agency's ability to address climate impacts at the time of development.

In developing mitigation measures for this lease sale, the BLM needs to fully consider the impacts from climate change that are being seen locally, on a statewide basis, a national basis, and worldwide. Locally these include things like impacts to forage that livestock graze and impacts to the habitat of wildlife species that occur on BLM lands. Increased wildfire frequency and severity is a significant issue, as are invasive species problems. Globally and nationally things like increasing sea levels need to be considered. BLM can at least put in place measures to mitigate local impacts in this EA because BLM has widespread authority over these lands.

BLM must seek to avoid impacts; then minimize impacts (e.g., through project modifications, permit conditions, interim and final reclamation, etc.). This protects the other uses of public land – including hunting, fishing, and outdoor recreation – and gives industry better information to plan their investments and a more predictable and efficient permitting process. In accordance with NEPA, FLPMA, the Administrative Procedure Act, other laws and case-law, BLM's decisions regarding mitigation must not be arbitrary or capricious.

Mitigation measures can be used to support a finding of no significant impact (FONSI). *See, e.g., Spiller v. White*, 352 F.3d 235, 239 (5th Cir. 2003) (approving the use of mitigated FONSIs). But to do this, the *efficacy* of the mitigation measures must be fully analyzed and be *enforceable*. If the BLM issues a FONSI for this lease sale, it must ensure the mitigation measures relative to climate change outlined in it will be enforced.

Mitigation of impacts to air quality due to oil and gas development is discussed in the EA. EA at 27. BLM states that best management practices (BMPs), conditions of approval (COA) and compliance with the venting and flaring provisions at 43 C.F.R. § 3179 may be employed. A few potential emissions reductions measures that might be used are listed, which we appreciate. But while we appreciate these mitigation measures, we believe the BLM should analyze them fully as opposed to merely listing them and consider expanding them. Mitigation measures that deal with the local impacts of climate change, like increased fire severity and frequency, and invasive species incursions should be more fully considered. Tools such as regional mitigation strategies, compensatory mitigation funds, and conservation agreements should be considered. And BLM must ensure that the mitigation measures are fully enforceable if used to justify the issuance of FONSI for this lease sale.

vi. BLM must analyze option value, carbon sequestration, and climate impacts on multiple uses.

In this NEPA analysis BLM can and should apply the principles of option, or informational, value, which permit the agency to look at the benefits of delaying irreversible decisions.[39] A recent New York University School of Law report examines the business schemes and practices utilized by private oil and gas companies when leasing public lands. The report, attached as Exhibit 5, found that "[w]hile private companies routinely account for option value, timing their purchasing and development decisions to be privately optimal, BLM fails to account for option value in its land use planning and lease sale processes."[40] Failing to account for the informational value of waiting puts the American people at economic and financial disadvantages. The consideration of option value before offering leases would result in more consideration of climate risks and would reduce economic costs.[41]

[39] *See* Jayni Foley Hein, *Harmonizing Preservation and Production,* INSTITUTE FOR POLICY INTEGRITY at 13 (June 2015) ("Option value derives from the ability to delay decisions until later, when more information is available... In the leasing context, the value associated with the option to delay can be large, especially when there is a high degree of uncertainty about resource price, extraction costs, and/or the social and environmental costs of drilling.") *available at* https://policyintegrity.org/files/publications/DOI_LeasingReport.pdf.
[40] New York University School of Law; Institute for Policy Integrity, *Look Before You Lease; Reducing Fossil Fuel Dominance on Public Lands by Accounting for Option Value* 4 (2020).
[41] *Id*. at 24.

The report makes recommendations for how BLM can modernize their leasing and planning processes to account for option value, and ensure the public is fairly compensated for its forgone option value. BLM can do this using existing legal authority. Recommendations include offering only high-potential lands, if any, in lease sales, increasing minimum bids, and exploring other means of accounting for environmental and social considerations (such as valuing carbon sink attributes). Option value considerations are of notable importance in the ongoing planning effort given the extreme drop in oil prices in recent months.

It is well established that issuance of an oil and gas lease is an irreversible commitment of resources. As the U.S. Court of Appeals for the D.C. Circuit held in the context of considering the informational value of delaying leasing on the Outer Continental Shelf, "[t]here is therefore a tangible present economic benefit to delaying the decision to drill for fossil fuels to preserve the opportunity to see what new technologies develop and what new information comes to light." *Ctr. for Sustainable Econ.*, 779 F.3d at 610. The NEPA analysis for leasing must evaluate the economic benefits that could arise from delaying leasing and/or exploration and development by making much of the planning area closed to oil and gas leasing. Potential economic benefits include improvements in technology, additional benefits that could come from managing these lands for other uses, including special designations, and additional information on the impacts of climate change and ways to avoid or mitigate resulting changes to the affected environment.

BLM has the ability and obligation to undertake an analysis of the benefits of delaying leasing, which can be both qualitative and quantitative, considering both economic and environmental needs. In *Wilderness Workshop*, plaintiffs proposed a land use planning alternative where low and medium potential lands would be closed for leasing. BLM declined to consider the alternative, claiming it had already considered and discarded a "no leasing" alternative. 342 F. Supp. at 1167. The court ruled against the agency and found: "[t]his alternative would be 'significantly distinguishable' because it would allow BLM to consider other uses for that land." *Id*. Considering such an alternative would permit BLM to consider the option value of delaying leasing on low potential land and better consider climate change impacts.

In this NEPA analysis BLM should consider at least one alternative where option values would be preserved, delaying or deferring leasing. The BLM should attach stipulations to the leases that permit consideration of option value when development is proposed.

The BLM should also consider the values of its lands for sequestering carbon dioxide, and thus reducing climate change impacts, in this NEPA analysis. Native grasslands, rangelands, and soils can be important means to sequester carbon, thus removing it from the atmosphere. Development of these areas would release carbon stored in biomass as well as foregoing future carbon storage opportunity. Taken together, this is just as much part of the emissions analysis as lifecycle emissions from development and use the fuels themselves. This issue, therefore, must be considered in the NEPA analysis for this lease sale. Facilitating or promoting carbon sequestration is an important alternative or mitigation measure that could be adopted for this lease sale and must be fully analyzed.

BLM must also fully analyze the impacts of climate change on other multiple uses, including ways

to mitigate those impacts. As discussed above, the USU study, discusses the impact of climate change on BLM's multiple use mission and makes recommendations for how to address this issue. BLM fails to account for climate change as needed to fulfill its conservation mandate, especially the need for prioritizing different uses. More effective incorporation of science is needed for effective natural resources management in the face of a climate-change-affected future. Passive uses are under-prioritized by BLM in favor of active uses. Energy extraction contributes the most to anthropogenic climate change of all the land uses BLM manages. BLM must use the best available information, including but not limited to the USU study, to fully analyze the impacts of past, present, and reasonably foreseeable GHG emissions and associated climate impacts on multiple uses.

Mitigation measures should be considered in the context of BLM's multiple use mission and the need to protect those resources, such as cultural sites, wildlife resources, and recreation areas. The impacts of climate change to those resources must be fully analyzed. This should be fully apparent in the alternatives considered in the EA for this lease sale, as well as the baseline (affected environment) that is considered.

BLM has not conducted an options values analysis for this lease sale, which should be corrected. It also has not considered its multiple use mandate as a relevant consideration in analyzing and disclosing climate change impacts.

vii. BLM must analyze a reasonable range of alternatives.

It is imperative that BLM consider a reasonable range of alternatives for this lease sale that includes a range of options for reducing climate change impacts and GHG emissions. These would include, for example, no leasing, requiring mandatory offsets for GHG emissions, methane controls and other leasing stipulations, protections for carbon sinks, and consideration of option value alternatives. Other mitigation measures that could be included in the alternatives have been mentioned, such as tree planting and a carbon mitigation fee.

In this lease sale the BLM is only considering the "all or nothing" approach. EA at 10-11. This does not meet BLM's obligations under NEPA and needs to be reconsidered. BLM needs to considering deferring parcels in this lease sale to deal with climate change impacts as well as the other issues discussed in these comments.

viii. The underlying Resource Management Plan must support the NEPA analysis and leasing decisions.

The underlying RMP must support this lease sale with an up-to-date and scientifically supported climate change analysis of oil and gas leasing and development, including but not limited to quantification of reasonably foreseeable GHG emissions and associated climate change impacts, as well as a cumulative impact analysis and a discussion of the significance of the emissions. It should also include an up-to-date Reasonably Foreseeable Development Scenario (RFDS) to inform an accurate analysis of climate impacts, as well as availability and other plan-level direction on oil and gas leasing and development that fully accounts for climate impacts. *See Wilderness Workshop*, 342 F. Supp. 3d at 1167 (holding that BLM RMP must include full climate analysis

and consideration of alternatives that would make low and medium potential lands unavailable for leasing).

As discussed above, the Shoshone Eureka RMP applicable to the Mount Lewis Field Office does not meet these needs. EA at 4. To rectify these deficiencies, BLM should prepare an RMP amendment and corresponding new or supplemental EIS prior to leasing. *See* 40 C.F.R. § 1502.9(c)(i)-(ii) (supplemental EIS required where substantial changes have occurred and/or significant new circumstances or information exist).

5. BLM must fully account for climate impacts under the Administrative Procedure Act

Besides complying with NEPA, BLM must ensure the climate change analysis for this lease sale complies with the Administrative Procedure Act (APA). The APA provides that agency action can be set aside when it is deemed "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A).

The BLM operates under many requirements that demand full consideration of climate change issues and mitigation relative to this lease sale. For instance, the BLM can require "reasonable measures" on an oil and gas lease "to minimize adverse impacts to other resource values." 43 C.F.R. § 3101.1-2. Lessees must "conduct operations in a manner that minimizes adverse impacts to land, air, and water, to cultural, biological, visual, and other resources, and to other lands uses or users." BLM Form 3100-11 (BLM's standard lease form). The BLM must "take any action necessary to prevent unnecessary or undue degradation" of the public lands. 43 U.S.C. § 1732(b). The BLM must comply with its multiple use mandate, including considering the present and future needs of the American people, providing for the long-term needs of future generations, and ensuring the "harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment" considering the relative values of the resources. *Id.* § 1702(c). Environmental protection measures are required to be incorporated in oil and gas leases by the MLA. 30 U.S.C. § 226(g).

To avoid BLM's climate change decisions relative to this lease sale being deemed arbitrary and capricious the BLM must meet the standards set by the courts. Under the APA, an action is arbitrary and capricious "if the agency has relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise." *Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983). The APA's standard of reasoned decision-making requires agencies to consider both the advantages and disadvantages—in other words, both the costs and benefits—of their decisions. *Michigan v. EPA*, 135 S. Ct. 2699, 2707 (2015). In this lease sale the climate change analysis must demonstrate full consideration of all relevant factors in a reasoned way to avoid being deemed arbitrary and capricious.

6. BLM must fully account for, reduce, and mitigate the impacts of climate change in its leasing decisions as required by FLPMA and the MLA.

In the context of the existential crisis posed by climate change, the significant GHG emissions originating from Federal public lands, and the serious detrimental impacts of climate change on multiple uses, BLM must fully analyze and disclose for the climate impacts associated with this lease sale, reduce the impacts as much as possible, and fully mitigate any remaining impacts to ensure net zero climate emissions from public lands. BLM has ample authority to do so and indeed must do so to satisfy its statutory obligations under FLPMA and the Mineral Lease Act (MLA).

First, under FLPMA, BLM is required to manage public lands on the basis of multiple use and sustained yield. 43 U.S.C. § 1732. This in turn requires consideration of "the present and future needs of the American people," providing for "the long-term needs of future generations," and ensuring the "harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment [considering] the relative values of the resources." *Id.* § 1702(c). As the Supreme Court has explained:

> '"Multiple use management'" is a deceptively simple term that describes the enormously complicated task of striking a balance among the many competing uses to which land can be put, "including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and [uses serving] natural scenic, scientific and historical values."

Norton v. S. Utah Wilderness Alliance, 542 U.S. 55, 58 (2004) (quoting 43 U.S.C. § 1702(c)).

In recognition of the environmental components of the multiple use mandate, courts have repeatedly held that development of public lands is not required, but must instead be weighed against other possible uses, including conservation to protect environmental values. *See, e.g.*, *New Mexico ex rel. Richardson v. BLM*, 565 F.3d at 710. ("BLM's obligation to manage for multiple use does not mean that development *must* be allowed . . . Development is a *possible* use, which BLM must weigh against other possible uses—including conservation to protect environmental values, which are best assessed through the NEPA process." (emphasis in original)); *Wilderness Workshop v. BLM*, 342 F. Supp. 3d 1145, 1166 (D. Colo. 2018) ("the principle of multiple use does not require BLM to prioritize development over other uses" (internal quotations and citations omitted)). Just as BLM can deny a project outright in order to protect the environmental uses of public lands, it can also condition a project's approval on the commitment to mitigation measures that lessen environmental impacts. *See, e.g., Pub. Lands Council v. Babbitt*, 167 F.3d 1287, 1300–01 (10th Cir. 1999) ("FLPMA unambiguously authorizes the Secretary to specify terms and conditions in livestock grazing permits in accordance with land use plans"); *Grynberg Petro*, 152 IBLA 300, 307–08 (2000) (describing how appellants challenging conditions of approval bear the burden of establishing that they are "unreasonable or not supported by the data").

The multiple use framework's provision for protecting environmental resources and emphasis of the need to balance between present and future generations are highly relevant to consideration of climate change-related impacts. Climate change will inevitably affect future generations more than present ones and threatens to deplete a variety of resources – both renewable and non-renewable.

In addition, climate change is affecting and will continue to affect every other resource value included in the multiple use framework, whether environmental, recreational, or economic in nature, due to the many changes it is causing to the ecosystems of public lands and increased threats from natural disasters. *See, e.g.*, USU Report). In this context, satisfying FLPMA's multiple use and sustained yield mandate requires BLM to fully account for the climate impacts, reduce the impacts as much as possible, and fully mitigate any remaining impacts to ensure net zero climate emissions as a condition of approval on any leasing or development decisions

Second, climate mitigation is also necessary to satisfy BLM's obligation to prevent unnecessary or undue degradation (UUD) under FLPMA. 43 U.S.C. § 1732(b) (requiring BLM "[i]n managing the public lands . . . [to] take any action necessary to prevent unnecessary or undue degradation of the lands"); *see also Rocky Mountain Oil & Gas Ass'n v. Watt*, 696 F.2d 734, 739 (10th Cir. 1982) ("[i]n general, the BLM is to prevent unnecessary or undue degradation of the public lands."). In other contexts, BLM has defined its obligation to avoid UUD as requiring mitigation for adverse impacts. *See e.g.*, 43 C.F.R. §§ 3809.5 & 3809.420(a)(4) (in hard rock mining context, UUD means conditions, activities or practices that are not "reasonably incident" to the mining operation or that fail to comply with other laws or standards of performance, which include "mitigation measures specified by BLM to protect public lands"). The IBLA and courts have likewise recognized that BLM has authority to incorporate mitigation measures into project authorizations to prevent UUD. *See, e.g.*, *Theodore Roosevelt Conservation P'ship v. Salazar*, 661 F.3d 66, 76, 78 (D.C. Cir. 2011) (citing with approval *Biodiversity Conservation Alliance*, 174 IBLA 1, 5–6 (March 3, 2008), which held that an environmental impact may rise to the level of UUD if it results in "something more than the usual effects anticipated from [] development, subject to *appropriate mitigation*" (emphasis added)); *Biodiversity Conservation Alliance v. BLM*, No. 09-CV-08-J, 2010 U.S. Dist. LEXIS 62431, at *1, *27 (D. Wyo. June 10, 2010) (infill drilling project would not result in UUD where BLM required enforceable mitigation of project impacts).

Given the catastrophic impacts of climate change on public lands, multiple uses, and future generations, avoiding UUD necessarily requires BLM to ensure net zero carbon emissions from any leasing or development decisions. Given the global nature of climate change, it is *never* necessary to have a net incremental increase in GHG emissions because any emissions can be fully mitigated and offset. In other words, a net zero carbon budget can readily be accomplished, whether that is by not leasing, delaying leasing or development to account for option value, and/or imposing mandatory measures to mitigate and offset any GHG emissions as stipulations and/or conditions of approval. As mentioned previously, while net zero emissions should be achieved by 2030 to avoid the most catastrophic impacts of climate change, they absolutely must be achieved by 2050, with at least a 45 percent reduction in emissions by 2030.

FLPMA's broad policy directives support this approach. For instance, FLPMA calls on BLM to manage public lands "in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air *and atmospheric*, water resource, and archaeological values." 43 U.S.C. § 1701(a)(8) (emphasis added). It also directs BLM to receive "fair market value" for the use of public lands. *Id.* § 1701(a)(9). "Fair market value" is not defined in FLPMA, but BLM's economic valuation handbook and previous working groups convened by the Department of the Interior indicate that "economic, environmental, and social considerations [should be considered]

in determining the value of federal lands – including option value."[42] Because climate change, and thus all emissions of GHGs, create costs to be borne by society at large and by the BLM in adapting its lands to the changing climate, the "fair market value" of oil and gas extraction activities should take carbon costs into consideration and be addressed through mandatory compensatory mitigation.

Third, the MLA provides BLM with authority to require a net zero carbon budget, including through its broad discretion to determine which, and how much, public land to lease for mineral extraction. *See, e.g., W. Energy All. v. Salazar*, 709 F.3d 1040, 1044 (10th Cir. 2013); *W. Energy All. v. Jewell*, No. CV 16-0912 WJ/KBM, 2017 WL 3600741, at *3 (D.N.M. Jan. 13, 2017), rev'd sub nom. W. Energy All. v. Zinke, 877 F.3d 1157 (10th Cir. 2017). To address climate impacts, BLM may reduce the amount of land made available for leasing and/or require full mitigation of GHG emissions and associated climate impacts via lease stipulations and conditions of approval designed "to minimize adverse impacts to other resource values." *See* 30 U.S.C. § 226(g); 43 C.F.R. §§ 3101.1-2 & 3101.1–3; *see also* BLM Form 3100-11 at 3 (BLM's standard lease form requires lessees to "conduct operations in a manner that minimizes adverse impacts to land, air, and water, to cultural, biological, visual, and other resources, and to other lands uses or users"). Additionally, leasing under the MLA must generally be done in the "public interest," which necessarily requires consideration and mitigation of climate change. Indeed, BLM may, under the MLA, reject a bid for an oil and gas lease if accepting the offer is "unwise in the public interest." 30 U.S.C. § 192.

BLM has not complied with these obligations, and the lease sale cannot proceed absent full consideration and adoption of measures that would ensure net zero GHG emissions. BLM may not rely on Instruction Memorandum 2019-018 – which purports to disallow mandatory offsite compensatory mitigation – to avoid these obligations. IM 2019-018 fails to distinguish between localized impacts and the global impacts of climate change or recognize that climate impacts are unlikely to be full mitigated solely through onsite mitigation. Instead, it purports to forbid GHG offsets that would allow BLM to satisfy its obligations under FLPMA and the MLA to fully account for and mitigate climate change impacts. Reliance on the IM is arbitrary, capricious, and not in accordance with law.

7. BLM must fully consider and prevent methane waste

i. BLM failed to satisfy its obligation to prevent the waste of methane.

The release of methane from oil and gas operations due to its venting, flaring, or leaking—also referred to as waste—is a significant issue relative to climate change because methane is a far more potent GHG than carbon dioxide. Methane is at least 86 times more potent than carbon dioxide.[43] Between 2009 and 2015, 462 billion cubic feet (Bcf) of natural gas from federal leases was vented

[42] *See* New York University School of Law; Institute for Policy Integrity, *Look Before You Lease; Reducing Fossil Fuel Dominance on Public Lands by Accounting for Option Value* at 4 (2020); *citing* Jayni Foley Hein, *Federal Lands and Fossil Fuels: Maximizing Social Welfare in Federal Energy Leasing*, 42 HARV. ENVT'L L. REV. 1 at 39-40 (2018).

[43] Gayathri Vaidyanathan, *How Bad of a Greenhouse Gas is Methane?*, SCIENTIFIC AMERICAN (Dec. 22, 2015), https://www.scientificamerican.com/article/how-bad-of-a-greenhouse-gas-is-methane/.

or flared – enough to serve 6.2 million households for a year.[44] In 2008 "the economically recoverable volume represented about $23 million in lost Federal royalties and 16.5 million metric tons of carbon dioxide equivalent (CO2e) emissions."[45] The agency found that in 2013, 98 Bcf of natural gas was vented and flared from Federal and Indian leases. This volume had a sales value of $392 million and would have generated royalty revenues in excess of $49 million. Of the 98 Bcf of gas, it is estimated that 22 Bcf was vented and 76 Bcf was flared.[46]

Under the MLA the BLM is obligated to regulate waste. The MLA directs DOI to require "all reasonable precautions to prevent waste of oil or gas developed in the land," 30 U.S.C. § 225, and mandates that "[e]ach lease shall contain provisions for the prevention of undue waste." *Id.* § 187. The MLA also requires BLM to consider not just private oil and gas interests, but also the "interests of the United States" and the "public welfare" when leasing and regulating publicly owned oil and gas resources. *Id.* § 187. As described above, FLPMA's mandates to prevent unnecessary or undue degradation and to manage for multiple use and sustained yield and in a manner that protects environmental, air, and atmospheric values, likewise require BLM to regulate and limit natural gas waste and its significant contributions to climate change and associated degradation of public lands resources. 43 U.S.C. §§ 1701(a)(8), 1702(c), 1732(b).

The MLA's use of "all" to modify the term "reasonable precautions" shows that Congress intended BLM to aggressively control waste. The agency may not forego reasonable and effective measures limiting venting, flaring, and leaks for the sake of administrative convenience or to enhance the bottom lines of operators. *See Halliburton, Inc. v. Admin. Review Bd.*, 771 F.3d 254, 266 (5th Cir. 2014) (ruling that statutory term "all relief necessary" authorized broad remedies against defendant because "we think Congress meant what it said. All means all" (internal quotation omitted)); *City of Oakland v. Fed. Housing Fin. Agency*, 716 F.3d 935, 940 (6th Cir. 2013) ("a straightforward reading of the statute leads to the unremarkable conclusion that when Congress said 'all taxation,' it meant all taxation" (emphasis in original)).

The obligation to "use all reasonable precautions to prevent waste" applies to lease sale decisions regardless of any national waste rules the BLM may operate under. In 2016 the BLM adopted strong new waste regulations. Waste Prevention, Production Subject to Royalties, and Resource Conservation, 81 Fed. Reg. 83,008 (Nov. 18, 2016). The rule would have reduced venting of natural gas by 35% and flaring of gas by 49% and required companies to limit the waste (leaking) of this methane due to infrastructure failures, with significant air quality and climate change benefits. The rule was projected to reduce volatile organic compound (VOC) emissions by 250,000–267,000 tons per year (tpy) and methane emissions by 175,000–180,000 tpy (using the social cost of methane, estimated to be worth $189–247 million per year). *Id.* at 83,069.

Under the direction of this administration, however, the BLM abandoned (rescinded) the 2016 rule and adopted a new much weaker regulation in 2018. Waste Prevention, Production Subject to Royalties, and Resource Conservation; Rescission or Revision of Certain Requirements, 83 Fed.

[44] Waste Prevention, Production Subject to Royalties, and Resource Conservation, 81 Fed. Reg. 83,008 (Nov. 18, 2016).
[45] U.S. Bureau of Land Management, *Regulatory Impact Analysis for: Revisions to 43 CFR 3100 (Onshore Oil and Gas Leasing) and 43 CFR 3600 (Onshore Oil and Gas Operations) Additions of 43 CFR 3178 (Royalty-Free Use of Lease Production) and 43 CFR 3179 (Waste Prevention and Resource Conservation)*, at 2 (Nov. 10, 2016).
[46] *Id.* at 3.

Reg. 49,184 (Sept. 28, 2018). The new rule seeks to remove five key policies of the 2016 rule (including leak detection and repair requirements) and modify and/or replace three other significant provisions (including gas capture related to flaring requirements). The new rule would retreat to the outdated provisions in Notice to Lessees 4A (NTL-4A)[47] and would rely on inadequate state waste rule provisions which do not even exist in some cases. The 2018 rule is being challenged in court. *State of California v. Bernhardt*, Case No. 18-cv-05712-YGR (N.D. Cal.) (filed Sept. 18, 2018). Regardless of the status of these national rules, the BLM still has an obligation to "prevent" waste that could occur as a result of this lease sale. This includes substantive waste prevention requirements, as well as a thorough NEPA analysis of methane (waste), climate change impacts, and consideration of mitigation measures to reduce waste.

Nor may BLM rely on inadequate state regulations as a proxy for fulfilling its independent obligation to prevent methane waste. While the agency's 2018 rule purports to rely on a patchwork of state regulation, this approach leads to the absurd result that waste of federal public minerals differs by state and abrogates the agency's affirmative obligation under the MLA to prevent that waste and protect the public interest in the development of public minerals. That obligation may not be delegated to the states. *See Assiniboine & Sioux Tribes of the Fort Peck Indian Reservation v. Bd. of Oil & Gas Conservation of Mont.*, 792 F.2d 782, 795 (9th Cir. 1986); *Lomax Expl. Co.*, 105 IBLA 1, 7 (1988).

The BLM must exercise its authority to minimize waste of publicly owned natural gas from all leases issued in this sale and should do so by incorporating waste minimization stipulations as lease notices in the lease terms. Specifically, BLM should consider or incorporate lease notices or stipulation provisions to address issues that were covered under the 2016 final rule but left unaddressed in the 2018 rule. Lease notices should:

- Require the submission of a waste minimization plan along with every APD;
- Mandate operators meet monthly gas capture percentage targets as outlined in the 2016 rule;
- Establish restrictions on flaring;
- Prohibit venting during liquids unloading operations;
- Require operators to report volumes of gas vented, flared and leaked;
- Require the capture of emissions associated with well drilling, completion and testing operations;
- Establish waste minimization requirements for pneumatic controllers and diaphragm pumps;
- Establish a comprehensive leak detection and repair (LDAR) inspection and reporting protocol for all well production facilities similar to that of the 2016 final rule.

In addition, BLM should require green completion techniques for every well, require operators to install vapor recovery units at new facilities, implement emission controls for storage vessels and

[47] NTL-4A requires the BLM to address venting and flaring on a case-by-case basis resulting in a tremendous administrative burden. Since NTL-4A was issued, technologies and practices for oil and gas production as well as technologies for controlling emissions have advanced considerably and "NTL-4A neither reflects today's best practices and advanced technologies, nor is particularly effective in requiring their use to avoid waste." 81 Fed. Reg. 6,616, 6,628 (Feb. 8, 2016).

glycol dehydrators that would reduce emissions by 95%, ensure at least 70% of gas compression at compressor stations and well heads would be powered by electricity, and require all pneumatic controllers at gas gathering and boosting stations, well sites, and gas processing plants to meet the EPA new source performance standards (NSPS) requirements. The inclusion of these emission control requirements would result in real and significant emission reductions and constitute reasonable and feasible mitigation measures that must be fully considered and adopted.

The BLM has required waste prevention measures aside from the requirements of the 2016 Rule in several Field Offices, including North Dakota, Price, Utah, and Royal Gorge, Colorado. BLM should provide in this lease sale for similar proactive measures to analyze and incentivize methane capture. These measures should be imposed as stipulations attached to the leases and as mandatory conditions of approval attached to drilling permits approved for existing leases.

While implementing methane waste prevention technologies or practices may result in reduced profitability for a single low-producing well, the costs associated with that business decision are spread among all the company's assets, and additional gas capture across a field can easily offset those marginal losses. BLM must consider these interests when evaluating waste and pollution in its lease sale decision. Furthermore, BLM must evaluate the economics of drilling projects by accounting for the benefits of methane reductions to public health, the climate, and the environment, as well as the costs to these same resources from impacts caused by methane emissions that could be prevented.

In short, the BLM must meet its obligation to reduce waste and increase federal revenues by ensuring lease terms include waste minimization requirements, and it has numerous reasonable and feasible tools for doing so.

The BLM needs to fully consider its obligation to prevent waste of methane at the leasing stage under the requirements in the MLA. 30 U.S.C. §§ 187 and 225. These requirements apply in addition to any national waste prevention rules that BLM may operate under. The procedures we outlined above should be required.

ii. BLM Failed to Adequately Analyze Methane Emissions under NEPA or the APA.

As discussed in the preceding sections, BLM is obligated under NEPA and the APA to fully analyze and quantify lifecycle methane emissions, associated climate impacts, and mitigation measures. First, BLM must use the best available science by analyzing the warming potential of methane emissions using both the IPCC's current upper-end 100-year global warming potential (GWP) for fossil methane of 36, and the IPCC's current upper-end 20-year GWP for fossil methane of 87. *See W. Org. of Res. Councils v. U.S. Bureau of Land Mgmt.*, CV16-21-GF-BMM, 2018 WL 1475470, at *18 (D. Mont. Mar. 26, 2018). In addition to using the correct GWPs, BLM must utilize best available tools for lifecycle analyses of fossil fuel extraction, operations, transport and end-user emissions, including combustion. The Interagency Working Group developed social cost of greenhouse gases, such as the Social Cost of Methane (SCM). The 2010 SCM has been estimated to be between $370 and $2,400 per ton of methane in 2007 dollars.[48] Relative to carbon

[48] Interagency Working Group on Social Cost of Greenhouse Gases, United States Government, *Addendum to Technical Support Document on Social Cost of Carbon for Regulatory Impact Analysis under Executive Order*

dioxide, methane has much greater climate impacts in the near term than the long term, and, therefore, also including a short-term measure of climate impacts would be most effective in considering policies to avoid significant global warming within the near-term. The BLM should use the SCM methodology to analyze methane emissions that are likely to occur due to this sale.

BLM also must ensure that its analysis accurately estimates the amount of methane emitted by oil and gas operations. A recent study showed that the Federal government has underestimated the amount of methane emitted by oil and gas operations by nearly sixty percent.[49] Considering methane leaks, "the volume represents enough natural gas to fuel 10 million homes – lost gas worth an estimated $2 billion." Three research findings came about as a result of this five-year study: (1) methane emissions are significant across the whole supply chain; production of oil and gas accounts for the largest share, (2) inventories systematically underestimate overall emissions, and (3) emissions from unpredictable, widespread sources are responsible for much, but not all, of the discrepancy.[50]

And as discussed above, BLM also must fully consider the methane waste control measures described above, including implementation of mandatory mitigation measures in one or more alternatives.

The BLM has not considered using the SCM protocol in this EA, nor is it even mentioned. BLM also only disclosed the GWP for the 100-year timeframe for methane. EA at 22. As stated above, BLM must use the best available science by analyzing the warming potential of methane emissions using both the IPCC's current upper-end 100-year global warming potential (GWP) for fossil methane of 36, and the IPCC's current upper-end 20-year GWP for fossil methane of 87. Additionally, the mitigation measures almost entirely neglect methane emissions. EA at 27. These shortcomings need to be corrected.

Finally, the BLM must ensure the RMP(s) applicable to this lease sale are up to date relative to providing for methane waste prevention. The RMP must make provision for stipulations to prevent methane waste in order to demonstrate adequate measures are in place to ensure waste reduction. If the RMP has not adequately addressed methane waste prevention it cannot serve as the basis for this NEPA analysis and lease sale without amendment. In Colorado, for example, the Little Snake, Kremmling, and White River RMPs have deficiencies in their analysis of methane climate change issues.

F. BLM Must Avoid Leasing in Areas with Low or No Development Potential

1. Facilitating speculative leasing is inconsistent with the MLA and FLPMA.

The MLA is structured to facilitate the actual production of federal minerals, and thus its faithful application should discourage leasing of low potential lands. BLM's June 2020 lease sale would

12866: Application of the Methodology to Estimate the Social Cost of Methane and the Social Cost of Nitrous Oxide (2016), https://archive.epa.gov/epa/sites/production/files/2016-12/documents/addendum_to_sc-ghg_tsd_august_2016.pdf.

[49] *See* Environmental Defense Fund, *Measuring Methane: A Groundbreaking Effort to Quantify Methane Emissions from the Oil and Gas Industry* (2019), *available at* https://www.eenews.net/assets/2019/03/25/document_cw_01.pdf.

[50] *Id.* at 5.

violate this core principle in three ways: (1) the sale continues a long-extant trend of leasing lands with little or no potential for productive mineral development; (2) as a result, the sale encourages speculative, noncompetitive leasing, which creates administrative waste, not oil and gas production; and (3) it would destroy important option values by hamstringing decisional flexibility in future management.

i. The June 2020 sale would violate the MLA's core purpose by offering land with low mineral potential.

The MLA directs BLM to hold periodic oil and gas lease sales for "lands…which are known or believed to contain oil or gas deposits…" 30 U.S.C. § 226(a). DOI has, through its internal administrative review body, recognized this mandate. *See Vessels Coal Gas, Inc.*, 175 IBLA 8, 25 (2008) ("It is well-settled under the MLA that competitive leasing is to be based upon reasonable assurance of an existing mineral deposit.") Here, BLM has provided no evidence that the proposed parcels contain oil or gas deposits, as the MLA requires. *See* 30 U.S.C. § 226(a). Based on the pattern of lease sales in Nevada over the past three years, there is evidence to the contrary – that the lands encompassed by the parcels generally lack oil and gas resources. Our analysis shows all seven of the parcels proposed for this lease sale have low to very low development potential.

BLM confirms this in the EA. "Several parcels included in this lease sale are in areas with low to very low potential for development and where little to no actual oil and gas development has occurred in the last decade or more." EA at 25. And "[p]arcels with low to very low potential are again assumed to have no production." Id. at 26.

This is because the purpose of leasing lands for oil and gas development is to provide for production of oil and gas, and low potential lands are unlikely to actually produce oil and gas. Leases in low potential areas generate minimal to no revenue but can carry significant cost in terms of resource use conflicts. Leases in low potential areas are most likely to be sold at or near the minimum bid of $2/acre, or non-competitively, and they are least likely to actually produce oil or gas and generate royalties.[51] But those lands will still be encumbered by leases which limits BLM's ability to manage for other uses and resources. In offering the seven parcels involved in this sale which are in low potential lands, BLM risks precluding management decisions for other resources and uses such as wilderness, recreation, and renewable energy development. In prioritizing leasing of low potential lands, BLM is violating FLPMA's multiple use mandate and improperly elevating oil and gas leasing above other multiple uses.

BLM cannot claim that all it needs to do is meet the purpose and need stated for this project in the NEPA analysis. Meeting the multiple use mandate is *always* a purposed and need. See 43 U.S.C. § 1732(a) (requiring the Department of the Interior to apply multiple use management). And while other uses can occur on leased lands, after they have been leased the actual implementation and application of other uses, particularly fewer intensive uses, is significantly constrained due to the

[51] Center for Western Priorities, "A Fair Share" ("Oil Companies Can Obtain an Acre of Public Land for Less than the Price of a Big Mac. The minimum bid required to obtain public lands at oil and gas auctions stands at $2.00 per acre, an amount that has not been increased in decades. In 2014, oil companies obtained nearly 100,000 acres in Western states for only $2.00 per acre. . . Oil companies are sitting on nearly 22 million acres of American lands without producing oil and gas from them. It only costs $1.50 per year to keep public lands idle, which provides little incentive to generate oil and gas or avoid land speculation.").

contractual and property rights that are conveyed when public lands are leased. And subsequent analysis at the APD stage where stipulations can be applied does not alleviate this problem; the development rights have already been granted.

The Reasonably Foreseeable Development Scenario (RFD) referenced in the EA substantiates this point.

> As of June 2019, there are 165 authorized oil and gas leases in [the Battle Mountain District]. Since 1907, roughly 770 oil and gas wells had been drilled in Nevada, though there are just 96 active wells at the time of this EA.
>
> Shale Oil contains significant crude oil and may be used as a source of petroleum. The potential within the Analysis Area is low in the short term and probably low to moderate in the long term.

EA at 46.

There are currently only 119 active oil wells in Nevada and no gas wells. *Id.* at 23. "There is high uncertainty involved in drilling in Nevada; of 270 wells drilled since 1986, only 50 have produced commercial quantities of oil." *Id.* BLM only anticipates that 25 or fewer wells will be drilled on the leases being offered at the June 2020 lease sale. *Id.* at 24. In these low potential parcels, 95 percent of the wells are dry holes with less than 20% of the wells producing commercially. *Id.* at 12, 51.

BLM Nevada is currently spending an excessive amount of time and resources evaluating oil and gas leases that industry is either not bidding on or will likely never develop. Over the past 3 years, BLM has sold less than 10% of the acres it has offered for sale in Nevada, compared with other western states, which are generally selling 70% or more.[52] Multiple lease sales have garnered zero competitive bids.

Sale	**Parcels (sold / offered)**	**Acres (sold / offered)**
Mar. 2015	13 / 24	15,244 / 25,882
June 2015	0 / 124	0 / 256,875
Dec. 2015	0 / 3	0 / 3,641
Mar. 2016	0 / 39	0 / 50,416
June 2016	4 / 42	3,765 / 74,661
Mar 2017	20 / 67	35,502 / 115,970
June 2017	3 / 106	5,760 / 195,614
Sept. 2017	3 / 3	3,680 / 3,680
Dec. 2017	17 / 208	33,483 / 388,697
Mar. 2018	11 / 40	19,432 / 69,691
June 2018	22 / 166	38,579 / 313,715
Sept. 2018	0 / 144	0 / 295,174

[52] All data obtained from BLM (https://www.blm.gov/programs/energy-and-minerals/oil-and-gas/leasing/regional-lease-sales/nevada) and EnergyNet (https://www.energynet.com/govt_listing.pl).

Dec. 2018	2 / 17	3,392 / 32,924
July 2019	11 / 200	22,352 / 389,176
Sept. 2019	6 / 28	9,164 / 32,342
Oct. 2019	10 / 141	19,052 / 269,184
Nov. 2019	2 / 48	3,974 / 111,420
Dec. 2019	6 / 156	13,217 / 268,052
Total	**130 / 1,556 (8.4%)**	**226,596 / 2,897,114 (7.8%)**

Recently, The Wilderness Society and the Center for Western Priorities developed a report, *America's Public Lands Giveaway*, documenting this trend. That report can be found at https://westernpriorities.org/2019/09/19/story-map-americas-public-lands-giveaway/a and is referred to as Exhibit 6 and is attached hereto and incorporated herein by this reference. As the first table in Exhibit 6 shows, of the 827,651 acres that have been offered for lease in Nevada as of August 2019, only 114,339 acres were sold competitively for the minimum bid ($2.00 per acre) and 526,178 acres had to be leased noncompetitively with no bid, at the minimum rental rate of $1.50 per acre. This means 77% of the leases were leased for $2.00 per acre or less. And as the second table in Exhibit 6 shows, 803,454 acres out of the total of 827,651 acres leased, or 97 percent, are sitting idle with no activity on them. This pattern underscores just how inefficient and wasteful the oil and gas program in Nevada has become, and also demonstrates that BLM Nevada's oil and gas leasing program is inconsistent with the direction set forth in the MLA.

Additionally, BLM in its June 2020 EA violates NEPA because it failed to consider a reasonable range of alternatives by omitting any option that would meaningfully limit leasing and development. *Wilderness Workshop*, 342 F. Supp. 3d at 1167. In that case, conservation group plaintiffs argued that BLM should have considered "an alternative eliminating oil and gas leasing in areas determined to have only moderate or low potential for oil and gas development." *Id.* at 1166. The court agreed, finding that BLM did not closely study an alternative that closes low and medium potential lands when it admits there is an exceedingly small chance of them being leased. This alternative would be "significantly distinguishable" because it would allow BLM to consider other uses for that land. *Id.* at 1167, *citing New Mexico ex rel. Richardson v. Bureau of Land Mgmt.*, 565 F.3d at 708-09. Thus, the court held that BLM's failure to consider reasonable alternatives violated NEPA. *Id.* at 1167. The same appears to be true here.

The BLM is not excused from meeting the requirements of the MLA to avoid leasing low potential lands just because it claims leasing is in line with the purpose and need stated for this EA or the leasing guidance in the Shoshone Eureka RMP. Nor do expressions of interest mandate leasing. Leasing is a *discretionary* action (BLM "may" issue leases—30 U.S.C. § 226(a)) not mandatory, and it is limited to areas "known or believed to contain oil or gas deposits." And considering only two alternatives—lease everything or lease nothing—does not meet NEPA requirements or the requirements of FLPMA and NEPA. While leasing may not preclude other multiple uses it very decidedly limits the options that BLM has available for future land management.

ii. The June 2020 lease sale would encourage noncompetitive, speculative leasing.

Besides being wasteful and contrary to the MLA's purpose, the ongoing leasing of lands with little

or no development potential creates another related problem: it facilitates, and perhaps even encourages, below-market, speculative leasing by industry actors who don't actually intend to develop the public lands they lease. This problem creates more administrative waste and also fails to uphold the MLA's core purpose.

This has proved to be true in Nevada, where federal oil and gas lease sales have generated just $0.31 per acre offered in bonus bids over the past 3 years, compared to other western states which generate hundreds or even thousands of dollars per acre offered. This is shown in this table:

Nevada[53]	**Acres**	**Bonus Bids**
Mar. 2015	25,882	$30,496
June 2015	256,875	$0
Dec. 2015	3,641	$0
Mar. 2016	50,416	$0
June 2016	74,661	$24,740
Mar 2017	115,970	$74,780
June 2017	195,614	$29,440
Sept. 2017	3,680	$33,120
Dec. 2017	388,967	$66,978
Mar. 2018	67,791	$121,146
June 2018	313,715	$139,896
Sept. 2018	295,174	$0
Dec. 2018	32,924	$7,866
July 2019	389,176	$132,679
Sept. 2019	32,342	$23,532
Oct. 2019	269,184	$19,054
Nov. 2019	111,420	$7,950
Dec. 2019	268,052	$150,443
Total	**2,895,484**	**$862,120 ($0.30/acre)**

BLM must consider alternatives that account for and reflect the development potential of proposed leases. *See Wilderness Workshop*, 342 F. Supp. 3d at 1165 (requiring consideration of development potential when developing the range of alternatives for oil and gas decisions).

Failing to consider alternatives that would protect other public lands resources from oil and gas development also violates FLPMA. Considering only one alternative in which BLM would offer all nominated oil and gas lease parcels for sale, as is proposed here, regardless of other values present on these public lands that could be harmed by oil and gas development, would indicate a preference for oil and gas leasing and development over other multiple uses. Such an approach violates the agency's multiple use and sustained yield mandate. *See* 43 U.S.C. § 1732(a).

Going back to the MLA's language, lease sales are intended to foster responsible oil and gas

[53] All data obtained from BLM (https://www.blm.gov/programs/energy-and-minerals/oil-and-gas/leasing/regional-lease-sales/nevada) and EnergyNet (https://www.energynet.com/govt_listing.pl).

development, which lessees must carry out with "reasonable diligence." 30 U.S.C. § 187; *see also* BLM Form 3100-11 § 4 ("Lessee must exercise reasonable diligence in developing and producing…leased resources.").

BLM Nevada's oil and gas leasing program is also facilitating a surge in noncompetitive lease sales, which is fiscally irresponsible management of publicly owned lands and minerals. Because companies pay no bonus bids to purchase noncompetitive leases, taxpayers lose out in the noncompetitive leasing process. These sales do not enjoy the benefits of market forces and rarely result in productive development.

In states like Nevada that lack competition during lease sales, speculators can easily abuse the noncompetitive process to scoop up federal leases for undervalued rates, as shown in a recent report from the New York Times. Attached as Exhibit 7. The New York Times article affirms that "In states like Nevada, noncompetitive sales frequently make up a majority of leases given out by the Federal government." It provides examples of speculators, including in Nevada, intentionally using this process to nominate parcels for sale, then sitting on the sidelines during the competitive lease sales and instead purchasing the leases cheaper after the sale at noncompetitive sales. These speculators are then often unable to muster the financial resources to develop the lands they have leased, so they sit idle: "Two Grand Junction, Colo., business partners, for example — a geologist and a former Gulf Oil landman — now control 276,653 acres of federal parcels in northeastern Nevada. But they are still looking for the money they need to drill on the land, or even to pay for three-dimensional seismic surveys to determine whether there is enough oil there to try." *Id*. By failing to appropriately implement the MLA and ensure that parcels offered for sale have a "reasonable assurance" of containing mineral deposits, BLM is encouraging noncompetitive, speculative leasing, which deprives the public of bonus bids and royalties, and leaves taxpayers to foot the bill for industry speculation.

The speculative nature of noncompetitive leasing – and the administrative waste it creates – is evident from a common outcome in noncompetitive leasing: termination for non-payment of rent. A review of noncompetitive leases in Nevada shows that BLM frequently terminates these leases because the lessee stops paying rent.[54] The administrative waste this process creates is further exacerbated by the fact that there are no apparent consequences for companies engaging in this practice. Indeed, many of these companies continue to actively nominate and purchase oil and gas leases, despite the clear pattern of buying leases noncompetitively with little intent to develop and reneging on their contractual obligations shortly thereafter. This process cannot be characterized as anything other than wasteful, counterproductive, and contrary to the MLA.

Again, the stated national policy underlying oil and gas leasing is "the orderly and economic development of domestic mineral resources, reserves, and reclamation of metals and minerals to help assure satisfaction of industrial, security and environmental needs." 30 U.S.C. § 21a. Noncompetitive, speculative leasing on low-potential land does not further this policy goal, and instead occupies BLM resource specialists' time that would be better spent on other public lands

[54] This research is documented in the Center for American Progress's recent report, *Backroom Deals: The Hidden World of Noncompetitive Oil and Gas Leasing*, along with other concerns regarding speculative leasing raised in these comments. Available at https://www.americanprogress.org/issues/green/reports/2019/05/23/470140/backroom-deals/.

management activities – all while taxpayers pick up the tab.

iii. BLM must analyze the "option value" of offering parcels with low or non- existent development potential in order to avoid speculative leasing.

In addition to the concerns above, leasing lands with low potential for oil and gas development gives preference to oil and gas development at the expense of other uses while handcuffing BLM's ability to make other management decisions down the road. This is because the presence of oil and gas leases can limit BLM's willingness to manage for other resources in the future.

For example, in the Colorado River Valley RMP, BLM decided against managing lands for protection of wilderness characteristics in the Grand Hogback lands with wilderness characteristics unit based specifically on the presence of oil and gas leases, even though the leases were non-producing:

> The Grand Hogback citizens' wilderness proposal unit contains 11,360 acres of BLM lands. All of the proposed area meets the overall criteria for wilderness character…There are six active oil and gas leases within the unit, totaling approximately 2,240 acres. None of these leases shows any active drilling or has previously drilled wells. The ability to manage for wilderness character would be difficult. If the current acres in the area continue to be leased and experience any development, protecting the unit's wilderness characteristics would be infeasible…

Proposed Colorado River Valley RMP (2015) at 3-135.

Similarly, in the Grand Junction RMP, BLM expressly stated that undeveloped leases on low-potential lands had effectively prevented management to protect wilderness characteristics, stating:

> 133,900 acres of lands with wilderness characteristics have been classified as having low, very low, or no potential…While there is not potential for fluid mineral development in most of the lands with wilderness characteristics units, the majority of the areas, totaling 101,100 acres (59 percent), are already leased for oil and gas development.

Proposed Grand Junction Proposed RMP (2015) at 4-289 to 4-290.

The presence of leases can also limit BLM's ability to manage for other important, non-wilderness values, like renewable energy projects. *See*, e.g., Proposed White River RMP at 4-498 ("Areas closed to leasing…indirectly limit the potential for oil and gas developments to preclude other land use authorizations not related to oil and gas (e.g., renewable energy developments, transmission lines) in those areas.").

As stated in *America's Public Lands Giveaway*, "In September 2018 the Bureau of Land Management offered 295,000 acres of public land in Nevada for oil and gas development, many of them in prime sage-grouse habitat. Exactly zero of them sold at competitive auction, leaving all 144 parcels available for noncompetitive leasing. Within two months following the sale, 21 leases were scooped up noncompetitively for just $1.50 per acre." Similarly, here if BLM does not

consider the "option value" of the parcels it is proposing for oil and gas lease sale, it will rule the risk of precluding future management decisions to benefit other multiple use values.

The presence of leases can also limit the BLM's ability to manage for other important, non-wilderness values, like renewable-energy projects. *See, e.g.,* Proposed White River Res. Mgmt. Plan, at 4-498 (acknowledging "the potential for oil and gas developments to preclude other land use authorizations not related to oil and gas (e.g., renewable energy developments, transmission lines)"). In offering the parcels involved in this sale, the BLM runs a similar risk of precluding future management decisions for other resources and uses such as wilderness, recreation, and renewable-energy development.

In this context, BLM can and should apply the principles of option value or informational values, which permit the agency to look at the benefits of delaying irreversible decisions. *See* Jayni Foley Hein, *Harmonizing Preservation and Production 13* (June 2015) ("Option value derives from the ability to delay decisions until later when more information is available... In the leasing context, the value associated with the option to delay can be large, especially when there is a high degree of uncertainty about resource price, extraction costs, and/or the social and environmental costs of drilling."). Attached as Exhibit 8.

Thus, in evaluating this lease sale, BLM should have evaluated "option value" – the economic benefits that could arise from delaying leasing and/or exploration and development based on improvements in technology, additional benefits that could come from managing these lands for other uses, and additional information on the impacts of climate change and ways to avoid or mitigate impacts on the environment. This is essential, in particular, for lands with low or non-existent development potential. BLM has the ability and obligation to undertake an analysis of the benefits of delaying leasing, which can be both qualitative and quantitative, considering both economic and environmental needs, as shown by a recent Federal court decision.

As previously mentioned, in *Wilderness Workshop.*, the conservation group plaintiffs proposed a land use planning alternative where low and medium potential lands would be closed for leasing. BLM declined to consider the alternative, claiming it had already considered and discarded a "no leasing" alternative. The court found: "This alternative would be 'significantly distinguishable' because it would allow BLM to consider other uses for that land." 342 F. Supp. 3d at 1167. Considering such an alternative would permit BLM to consider the option value of delaying leasing on low potential lands.

As applied here, this economic principle suggests that BLM Nevada would be well-served by deferring the June 2020 lease parcels and preparing a programmatic EIS that considers alternative approaches for managing the oil and gas program in Nevada. The point of deferring and planning would be to ensure that BLM does not commit to moving forward with oil and gas leasing when, based on Nevada's current leasing patterns described above, economic and other indicators suggest doing so right now does not best serve the public interest.

America's Public Lands Giveaway, provides a detailed discussion of problems that are caused by inactive leases, many leased noncompetitively, and provides recommendations for how to improve the leasing system. Leasing at minimum bids or noncompetitively leads to many leases sitting idle

with a need to be terminated and not producing royalties since oil and gas is not produced, and other uses have been limited. *See* Exhibit 6. If BLM approached leasing based on an option value analysis, many of these problems could be avoided.

In this respect we remind you of the letter that Senator Cortez Masto sent to Kemba Anderson, the BLM Branch Chief of Fluid Minerals, on November 5, 2019 regarding the November oil and gas lease sale. In that letter the Senator asked for the protection of water resources and sensitive lands near Great Basin National Park, Ruby Lakes National Wildlife Refuge, and the Ruby Mountains. As she said, "Our public lands serve as a unique and valuable resource that boost local economies across all corners of our state, while providing public spaces for hunting, fishing, and outdoor recreation. I request that you reconsider inclusion of these parcels that are near our treasured public spaces." The same is true of the June 2020 lease sale parcels, and if BLM employed an option value analysis it would see that many of these parcels should be deferred from leasing. And Representative Horsford in his November 26, 2019 letter to the BLM regarding the March 2019 lease sale made similar points and expressed similar concerns about a number of lease parcels.

V. Conclusion

Based on the foregoing, BLM must complete additional analysis and fully comply with applicable law and guidance such as FLPMA and NEPA, prior to moving forward with this lease sale in the Battle Mountain District.

Sincerely,

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List of Exhibits

1. *WildEarth Guardians v. U.S. Bureau of Land Mgmt.*, 2020 U.S. Dist. LEXIS 77409 (D. Mont., May 1, 2020)
2. The Wilderness Society, *In the Dark.* https://www.wilderness.org/sites/default/files/media/file/In the Dark Report_FINAL_Feb_2018.pdf
3. The Wilderness Society, The Climate Report 2020: Greenhouse Gas Emissions from Public Lands. https://www.wilderness.org/sites/default/files/media/file/TWS_The%20Climate%20Report%202020_Greenhouse%20Gas%20Emissions%20from%20Public%20Lands.pdf.
4. Utah State University Climate Change Study
5. *Look Before You Lease; Reducing Fossil Fuel Dominance on Public Lands by Accounting for Option Value*. New York University School of Law; Institute for Policy Integrity
6. *America's Public Lands Giveaway*. https://westernpriorities.org/2019/09/19/story- map-americas-public-lands-giveaway/
7. "Energy Speculators Jump on Chance to Lease Public Land at Bargain Rates", The New York Times, Nov. 27, 2018. https://www.nytimes.com/2018/11/27/business/energy-speculators-public-land- leases.html
8. *Harmonizing Preservation and Production; How Modernizing the Department of the Interior's Fiscal Terms for Oil, Gas, and Coal Leases Can Ensure a Fair Return to the American Public.* New York University School of Law; Institute for Policy Integrity

Appendix

Parcel Numbers and Serial Numbers of Protested Parcels

NV-2020-06-0013
NV-2020-06-0019
NV-2020-06-0020
NV-2020-06-1273
NV-2020-06-1280
NV-2020-06-1291
NV-2020-06-1294

Exhibit 1:
Utah State University Climate Change Study

Impacts of climate change on the management of multiple uses of BLM land in the Intermountain West (USA)

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1. Executive Summary

The United States Bureau of Land Management (BLM) manages 248 million acres of public lands for multiple, often conflicting, uses. Climate change will affect the sustainability of these land uses and could increase conflicts among them. Although natural resource managers are concerned about climate change, many are unable to incorporate climate change into management plans. Due to institutional constraints and limited resources, managers are not always aware of, or do not always employ, current scientific knowledge. We summarize academic literature that discusses impacts of climate change on the multiple uses for which BLM manages in the Intermountain West, including a synthesis of projected vegetation changes and other foreseeable ecosystem changes. Further, we conducted a content analysis of BLM Resource Management Plans to determine how climate change is addressed by BLM mangers.

BLM land in the Intermountain West (IMW) has already experienced considerable climate change over the past century, including >0.9°C warming compared to the early 20th century and measurable decline in snowpack over the past few decades. All future scenarios predict accelerated warming and substantial changes in precipitation regimes, including:

- 3° C warming by 2050 and 5.3° C warming by 2085, relative to a 1970-2000 baselevel
- Further reductions in snowpack, reductions in the fraction of precipitation delivered as snow, reduction in the fraction of snowpack converted to streamflow, earlier snow melt
- Increased probability of multi-decadal, mega-drought
- Many other critical aspects of climate remain beyond the capability of climate models to predict, including changes in the frequency, timing, and spatial distribution of rainfall, changes in the formation and persistence of clouds, and changes in specific temperature and moisture regimes that serve as critical phenological cues for plants and animals.

We conducted an automated search of peer-reviewed literature and identified 225 papers published 2009-2018 that include the IMW, have been cited at least twice per year, and mention at least one BLM land use. BLM was only substantially discussed in 1% of the articles and explicit management recommendations were uncommon, both of which indicate that the scientific community could do a better job translating scientific insights into actionable information for BLM. We acknowledge that such knowledge transfer occurs in other forms, including meetings, workshops, conferences, and grey literature. Conservation and grazing were the most commonly studied land uses (138 and 85 articles, respectively). Recreation (55 articles), energy development (44), and logging and timber (41) were less frequently mentioned, and mining (24), cultural values (21), and wild horses and burros (5) were rarely discussed. Typically, the latter were often only briefly mentioned or discussed as a threat to conservation and ecosystem services. Most papers focused on one (39% of articles) or two (20%) land uses and avoided addressing the challenges of interacting and potentially conflicting land uses. When multiple uses were studied, the most prominent theme was that the more active uses (e.g., energy development, grazing, recreation) threaten passive uses (e.g., conservation, ecosystem services). We did not find any papers supporting the notion that climate change does not pose a major threat to BLM ecosystems and the services and products for which those lands are valued.

Augmenting our automated search with additional papers from the literature, we summarize the foreseeable impacts of climate change on BLM ecosystems. Looking specifically at vegetation

impacts, a quantitative meta-analysis shows a high degree of consistency in predicted future gains (+) and losses (-) for sagebrush (+ in some regions, - in others), pinyon-juniper (- throughout the IMW), and forage (+ throughout the IMW). Results for cheatgrass were less consistent. Our literature review indicates that climate change will to affect many other ecosystem processes, characteristics and services including:

- Degrading biological soil crusts
- Causing habitat loss, distributional shifts and declines in mammalian and fish populations
- Habitat loss and decreased recruitment, fecundity, and survival of numerous bird species
- Creating conditions favorable to invasive species
- Warmer and more variable conditions in aquatic ecosystems
- Decrease in ground- and surface-water availability
- Increased dust, which affects vegetation, water, nutrients and health of humans and animals
- Discordant shifts in phenology , especially for montane systems
- Increased occurrence, size, and severity of wildfire

We further summarize the impacts of climate change on uses for which BLM manages.

- Climate change poses some of the greatest threats to BLM's conservation mandate. Specifically, declines in big sagebrush will have significant negative impacts on a wide range of wildlife and plant species that depend on those communities. Some species may be able to shift upslope or northward, but some may not. Shifting species distributions may cause new and unpredictable species interactions. Soil conservation will be more challenging under future climate, as net primary production (NPP) is expected to decline in many parts of the IMW. Where NPP is predicted to increase, conservation gains may be offset by increased wildfire activity. Conservation of aquatic species is likely to be challenged by increased severity and duration of droughts as well as increased competition between human and ecosystem water demands.
- Livestock grazing is a complex issue with myriad factors influencing livestock and numerous impacts of livestock on the environment. Future climate will increase heat stress and diminish available water quantity and quality for livestock. Heat stress is likely to reduce reproduction, compromise metabolic and digestive functions, reduce weight gain, and increase mortality for livestock. Some of these effects may be offset by changing breeds. Climate change is also likely to alter the quantity, quality and location of forage, degrade air quality, increase transmission of diseases, and alter the spread of pests. Grazing may be impacted by national policy on carbon emissions as well as economic factors that reduce demand for livestock products.
- Recreation will be affected in numerous direct and indirect ways by climate change. Warmer temperatures are likely to increase participation in outdoor recreation, except in regions where daily high temperatures exceed 27-30° C. Hunting, fishing, and wildlife viewing opportunities on BLM land are particularly vulnerable to climate change via impacts on the species of interest.

- Other land uses are seldom discussed, but climate change is likely to have direct and indirect impacts on cultural and historical resources, horses and burros, and timber and logging.

A search of 44 Resource Management Plans (RMPs) developed by BLM field offices throughout the IMW, revealed very few mentions of climate change impacts on ecosystems and land uses. In general, references to climate change are vague in the plans, with very few specific predicted impacts or management considerations. Virtually none of the plans discuss BLM efforts to adapt to climate change impacts. While the RMPs are the legally binding documents that govern all BLM management actions, it is possible that BLM is attempting to address climate-related challenges to some extent using the existing management practices described in the plans, or other mechanisms, such as the Rapid Ecoregional Assessments. The time consuming and arduous task of developing and modifying RMPs calls into question whether the existing RMP framework is appropriate for adaptive management that will clearly be needed in the future.

2. Introduction

The United States (US) Bureau of Land Management (BLM) manages over 248 million acres of public land with a mandate to "sustain the health, diversity and productivity of the public lands for the use and enjoyment of present and future generations" (BLM Mission Statement n.d., Hardy Vincent, Hanson, and Argueta 2017). The multiple uses for which BLM manages these lands play a prominent role in the national economy and provide incalculable non-market value to society (Pederson et al. 2006, Kemp et al. 2015). However, multiple-use management of vast and diverse ecosystems is fraught with challenges, including conflicts amongst uses, an incomplete knowledge of complex and constantly evolving ecosystems, and discordant public, private, and political interests (Skillen 2009, Archie et al. 2014, Veblen et al. 2014, Butler et al. 2015, Wyborn et al. 2015). Exacerbating these challenges, anthropogenic climate change has long been understood to impact the resources and uses for which public lands are valued, and in some cases may cause non-linear and irreversible transitions in ecosystems (Baron et al. 2009, Joyce et al. 2009, West et al. 2009, Ellenwood et al. 2012, McNeeley et al. 2017, Halofsky et al. 2018). Yet, no comprehensive analysis has been conducted to articulate the myriad impacts of climate change on BLM land, uses, and ecosystems. Further, it remains unclear whether and how BLM has or is altering their 'on-the-ground' management practices in order to fulfill the agency's stated mission in the context of observed and future predicted climate change. Although specific BLM field offices are adapting to the localized consequences of climate change, it is unclear how extensive these adaptations are for BLM management (Kemp et al. 2015).

The BLM operates in a highly decentralized manner, with many field offices across the US working quasi-independently in order to provide flexibility to develop close partnerships

with state and local agencies, as well as landowners and stakeholders. But as a branch of the US Department of the Interior, local offices are also obligated to national policy and political pressures. In 2001, the Secretary of the Interior signed Secretarial Order 3226 requiring each Bureau and Office within the Department of Interior, including the BLM, to "consider and analyze potential climate change impacts" in planning and prioritization exercises (Ellenwood et al. 2012). This order was augmented with numerous Presidential Executive Orders, memoranda, reports and operational manuals developed between 2013 and 2016 (e.g., EO 13653 of November 1, 2013 "Preparing the United States for the Impacts of Climate Change", Presidential Memorandum of November 3, 2015, "Mitigating Impacts on Natural Resources from Development and Encouraging Related Private Investment", Report of the Executive Office of the President of June 2013, "The President's Climate Action Plan", and Department of the Interior Departmental Manual Part 523, Chapter 1: Climate Change Policy, dated December 20, 2012). Furthermore, in 2014, the director of the BLM tasked the Advancing Science Integration Strategy Team to develop a plan to improve the creation and utilization of science to inform BLM's management of public land. In March of 2015, BLM released the plan, which asserted that "effective and consistent integration of the best available science in decision-making is becoming more and more essential for public land management in an era of changing climate… and diverse legal challenges" (Kitchell et al. 2015). However, these orders, reports and policies were rescinded in 2017 in order to eliminate "potential burdens" to US energy development (Secretarial Order 3360 "Rescinding Authorities Inconsistent with Secretary's Order 3349, 'American Energy Independence'"). Nevertheless, every management plan finalized and approved by the BLM between 2001 and 2017 was mandated to address climate change in its decision-making process.

This paper analyzes climate change research and BLM management plans in the Intermountain West (IMW), a highly sensitive region that contains 142 million acres of land managed by BLM (Fig. 1; Hardy Vincent, Hanson, and Argueta 2017). The IMW includes areas between the eastern edge of the Rocky Mountains and the eastern edge of the Sierra Nevada and Cascade Mountains, stretching between the borders with Mexico and Canada, and including land in the states of Washington, Oregon, California, Idaho, Nevada, Utah, Arizona, Montana, Wyoming, Colorado and New Mexico. This region includes some of the hottest and driest areas in North America and contains a wide variety of ecosystems, many of which are water-limited, exhibit low primary productivity, and contain fragile, erosion-prone, and low-fertility soils (Maestre et al. 2012).

Our research examines both peer-reviewed scientific literature pertaining to the IMW, as well as BLM Resource Management Plans from field offices in the IMW in order to answer the following research questions:

1) How is climate predicted to change for BLM lands in the Intermountain West?

2) Based on the peer-reviewed literature, what are the likely impacts of climate change on the multiple uses of BLM land? What impacts are predicted with sufficient confidence to inform management? Are there critical knowledge gaps?

3) How is climate change discussed and considered in BLM Resource Management Plans? Do BLM Resource Management Plans address climate change-related concerns described in the peer-reviewed literature?

3. Climate Change in the Intermountain Western US

The IMW has already experienced a considerable amount of warming over the past century. Comparing average temperatures throughout the IMW during the thirty-year period 1989-2018 to the period 1895-1924, the region has warmed nearly 0.9°C, with land managed by BLM having experienced warming approximately equivalent to the regional average (Fig. 1). On

more local scales, the highest amounts of warming (> 2°C) have historically occurred in areas managed by the BLM in western Colorado, eastern and southern Utah, southern Nevada, and eastern California. Notably, BLM also manages land in eastern Nevada indicated as having experienced slight cooling over the same timeframe, further highlighting the challenges faced in planning for changes in this large and diverse region.

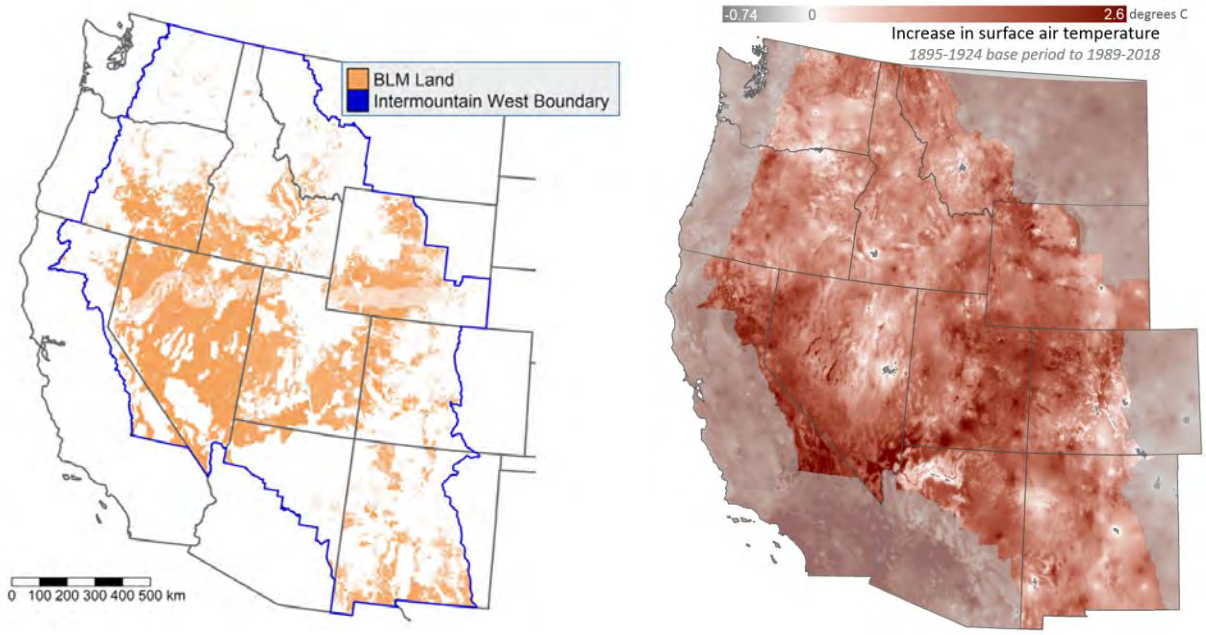

Figure 1. Our study area (left panel) includes the Intermountain Western US (IMW), outlined in blue, and specifically focuses on land managed by the US Bureau of Land Management, highlighted in orange. The right panel shows observed (interpolated) change in the average surface air temperature (2 m above surface) between two time periods, comparing 1895-1924 to 1989-2018. Temperature data was synthesized from PRISM Climate Group, Oregon State University, http://prism.oregonstate.edu, Map created June 4, 2019.

Climate models are in close agreement that the IMW will experience additional warming under all foreseeable future scenarios (IPCC 2014, Frölicher et al. 2014, Palmquist et al. 2016, USGCRP 2017, Gonzalez et al. 2018, IPCC 2018, USGCRP 2018). Under the fossil fuel intensive (i.e., business-as-usual) Representative Concentration Pathway 8.5 scenario (RCP 8.5), average annual surface air temperature for land managed by BLM in the region is expected to

increase another 3.0°C by the 30-year period centered on 2050 and 5.3°C for the 30-year period centered on 2085, relative to the 1970-2000 baseline period (Fig. 2, Maurer et al. 2007).

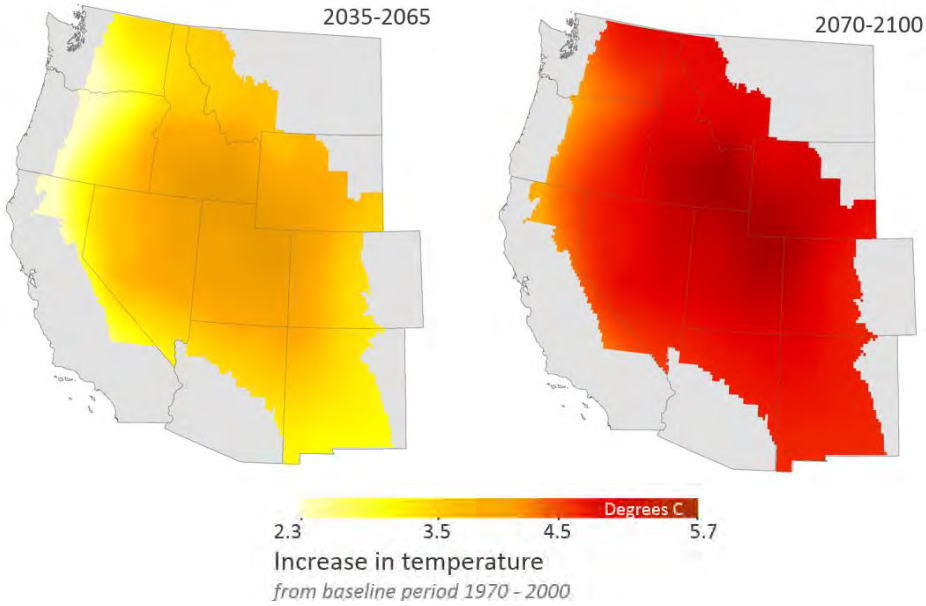

Figure 2. Future predicted change in mean annual temperature, relative to a 1970-2000 baseline. Data obtained from the World Climate Research Program's Working Group on Coupled Modelling CMIP5 multi-model ensemble (Maurer et al. 2007) available at: https://gdo-dcp.ucllnl.org/ downscaled_cmip_projections/dcpInterface.html.

Precipitation patterns in the region have also changed significantly in the past several decades. Seasonal snowpack provides the vast majority of water for the IMW (Strum et al. 2017, Julander and Clayton, 2018). Over the past 30 to 65 years, seasonal maximum snowpack and snowpack water content have both declined (Saley et al. in review, Pierce et al. 2008, Mote et al. 2016, 2018, Fyfe et al. 2017, Li et al. 2017, Chavarria and Gutzler, 2018). The fraction of precipitation falling as snow has decreased, the timing of snow melt has shifted to earlier in the season, and the fraction of snowpack that is converted to streamflow has decreased (Lute et al. 2015, Barnhart et al. 2016, Harpold et al. 2017, 2018, Solander et al. 2017). Future precipitation predictions are generally in agreement that the hotter temperatures expected under all future scenarios will further exacerbate the reductions in snowpack, reductions in the fraction of

precipitation delivered as snow, reductions in the fraction of snowpack that is converted to streamflow and timing of melt (Cook et al. 2014, Klos et al. 2014, Musselman et al. 2017, Rhoades et al. 2017).

The probability of decadal to multi-decadal mega-drought increases with hotter temperatures (Ault et al. 2014, 2016, Cook et al. 2016, Prein et al. 2016). Future climate predictions suggest 99% of the Colorado Plateau, which comprises a large portion of the IMW, will experience drying by 2075, with an average 17% increase in aridity across ecoregions in the Colorado Plateau (Copeland et al. 2017). Multi-decadal mega-droughts in the latter 21st century for moderate (RCP 4.5) and high (RCP 8.5) future emissions scenarios are predicted to significantly exceed any drought cycles observed in the past millennium throughout the American Southwest (Cook et al. 2015).

Ecosystems are affected by many more nuanced characteristics of the temperature and precipitation regime, some of which are not as well predicted by current climate models (Snyder et al. 2019, Bradley et al. 2016). Such phenomena include changes in the frequency, timing, and spatial distribution of rainfall, changes in the formation and persistence of clouds, and changes in specific temperature and moisture regimes that serve as critical phenological cues for plants and animals. Many of the more nuanced changes are likely to be correlated with the general trend (i.e., warming and increased variability).

4. Methods

We addressed our research questions with three approaches. First, we conducted a systematic review of academic, peer-reviewed literature pertaining to climate change in the IMW. We augment this systematic literature review with insights from papers that fell outside

the rigid constraints of our automated search in order to provide a more complete synthesis of implications of climate change on BLM lands and land uses. Second, we synthesized modelling results from numerous studies predicting vegetation change throughout the IMW. Third, we performed a content analysis of BLM Resource Management Plans throughout the IMW.

Systematic Literature Review

The systematic literature review was used as an objective means to identify recent articles that provide insights regarding climate change in the IMW, observed or expected impacts, and implications for land management. After systematically gathering all articles identified by climate change and IMW identifiers, we coded and read all articles pertaining to uses for which BLM manages.

We used Scopus to identify recent peer-reviewed literature relevant to climate change in the IMW. We searched Scopus in February and March 2019 for all articles that contained both a climate change identifier as well as a regional identifier (e.g., climat* AND "*mountain west"; see Table S1, Appendix I) within the title, abstract or key words. We exported all bibliographic data directly as a bibtex file.

Initial data cleaning was completed using the R *Bibliometrix* package (Aria and Cuccurullo 2017). First, we removed duplicate articles with the *duplicatedMatching* function. After deduplication, we scanned for, and removed, articles clearly outside the study area.

To determine how climate change will impact the BLM's management of multiple uses, we searched the abstracts of all articles for nine uses that are most relevant to BLM's mission ("About" 2016). These uses included: logging/timber, mining, grazing, energy [energy

extraction, development, and corridors], recreation, ecosystem services, conservation, historic/cultural values, and wild horse/burro management (Table 1).

Table 1. Operational definitions of the land uses analyzed for our systematic literature review.

Land use	Definition
Conservation	Protection of critical habitat, native wildlife and vegetation populations, natural resources, and natural landscapes
Ecosystem services	Direct and indirect contributions of ecosystems to human well-being, including water and air purification, carbon sequestration, and climate regulation
Cultural/historic value	Traditional, spiritual, cultural, and historic values that are tied to natural features or landscapes
Recreation	Outdoor participation on public lands, including camping, hunting, fishing, hiking, boating, cycling, and wildlife viewing
Wild horses & burros	Management and protection of wild horses and burros to ensure healthy populations
Grazing	Domestic livestock (mostly sheep and cattle) use of rangelands
Logging & timber	Harvest of timber for commercial purposes
Energy	Fossil fuel development, extraction, and corridors
Mining	Development and extraction of minerals, including gold, silver, copper, hard rock materials, coal, sand, and gravel

We narrowed the search to include only articles that referenced at least one land use in the abstract. We discarded all articles from 2019, as they only represented two months of publications (Jan/Feb), rather than all articles published that year, as well as articles published prior to 2009. While earlier literature could provide useful insights for BLM managers and to answer our research questions, limiting our systematic literature search to articles published

since 2009 helped ensure we were evaluating more recent papers that are likely to use more consistent and reliable climate forecasts as well as more recent analytical methods and models.

We further winnowed our search by keeping only articles that had a mean annual citation rate of 2 or more in order to discard articles that appear to have had very little impact. As articles from 2018 had only been published for a year or less at the time of analysis, we did not discard any articles published in 2018 based on the number of citations. The references for all of the articles gathered via this method are provided via Hydroshare.

Systematic Literature Review Coding

We developed a coding protocol to document the focus and relevance of the final set of papers identified in our search. Six different coders used a Qualtrics survey as a coding instrument (Appendix II) to determine, based on the body of the text, whether: (1) any part of the research took place in the IMW and where, (2) if it discussed climate change and its impacts, (3) if it discussed management, (4) if the BLM was mentioned, (5) if any BLM land uses were mentioned, and (6) if and how the paper was relevant to our research questions. In order to ensure reliability among all coders, we visually checked for consistency twice, adjusting the protocol based on the results. First, we tested reliability by having two coders code the same 50 articles, and then discussed inconsistencies as a group and revised our protocol to improve consistency. Next, all six coders coded the same 20 articles and we further revised our protocol before having each person code a distinct set of articles. Any questions that were not consistent between all six coders for all 20 articles were cut or revised, resulting in a final set of questions (Appendix II). Afterwards, the articles already coded were recoded for the revised questions. Data generated from our coding are available on Hydroshare.

Systematic Literature Review Content Analysis

The final phase of the systematic literature review involved a thematic analysis conducted by reading each article that included the IMW, mentioned climate change at least once within the body of the text, and mentioned at least one land use (n = 225). In reading each article, we determined the climate change impacts on the land uses the BLM manages, and further identified common themes throughout the literature.

Vegetation Change Analysis

As vegetation plays a central role in many BLM activities and concerns, we provide a novel and in-depth synthesis of recent studies that predict vegetation change throughout the IMW. Several peer-reviewed models predict climate change effects on important components of vegetation within the IMW, namely sagebrush (*Artemisia tridentata*), cheatgrass (*Bromus tectorum*), pinyon-juniper woodlands and forage production. Models used to make predictions of future changes in species distributions and/or abundances can be broadly categorized as process models or as correlational models, with correlations based on either spatial or temporal empirical relationships.

Process models employ theory based on underlying ecological mechanisms to predict species responses to future environmental conditions (Johnsen et al. 2001). Conversely, spatial correlations models correlate current species distributions or abundances to current climatic and environmental conditions, then predict future distribution and abundance based on predicted future climate (Elith and Leathwick 2009). Temporal correlations models correlate the effects of

current interannual climatic variation on interannual variation in species abundances or vital rates, and apply these relationships to future climate (Kleinhesselink and Adler 2018).

Models also incorporate a range of CO_2 emissions scenarios and model different indicators of species performance, which influence results. Given such disparate approaches and inputs, it would be no surprise if the models make inconsistent predictions. However, strong agreement among models regardless of methodological variation would increase confidence that their predictions should inform management decisions.

To evaluate consistency among predictions of vegetation change in the IMW, we identified all spatially explicit modeling studies since 2008. For each model, we noted the model type, indicator modeled, emissions scenario and latest time frame for which they projected results. In total, we identified 15 studies, containing 43 distinct projections. Of these 43 projections, 15 represented low emissions scenarios while 27 represented high emissions, and one projection represented an average of high and low emissions. The bulk of BLM land in the IMW falls within four ecoregions: the Northern Basin and Range, the Central Basin and Range, the Wyoming Basin, and the Colorado Plateau. As such, we focus primarily on results for those regions. Models addressed forage production by modeling grassland cover (Notaro et al. 2012, Hufkens et al. 2016), abundance of non-woody vegetation (Reeves et al. 2017), or primary productivity (Reeves et al. 2014, 2017, Hufkens et al. 2016). Primary productivity may not translate directly to forage production, but is interpreted as a proxy because primary productivity represents biomass available for grazers, and therefore forage quantity (Reeves et al. 2017).

To analyze vegetation change predictions, we downloaded the highest resolution image showing projected vegetation change from papers indicated in Table 2, imported them into ArcMap, and georeferenced them. We masked the data to include only data corresponding to

BLM land in the IMW, reclassified the pixels to indicate whether the vegetation type was predicted to increase, decrease or not change, and counted pixels within each of the 18 ecoregions within the IMW. This allowed us to calculate a mean change projected for each ecoregion in each dataset. Positive mean change denotes ecoregions with projected increases for a given species, and negative mean change denotes ecoregions with projected decreases.

Table 2. Studies used for the vegetation predictions.

Species	Study	Modeling method	Model type	Indicator	Emissions scenario	Time of projection	Fig.(s)
Cheatgrass	Boyte et al. (2016)	Regression tree	Statistics-based	Cover	RCP 4.5	2070	10
	Bradley (2009)	Mahalanobis distance	Statistics-based	Presence	A1B	2100	7, 8a, 8b, 9
	Brummer et al. (2016)	Boosted regression tree	Statistics-based	Cover	RCP 4.5	2080	5c
Forage	Hufkens et al. (2016)	PhenoGrass	Process-based	Cover; gross primary productivity	RCP 8.5	2100	2a (in text); 7k (in supplemental material)
	Notaro et al. (2012)	LPJ-GUESS DGVM	Process-based	Cover	A2FIXCO2, A2, B1	2100	4c,4i,4o
	Reeves et al. (2017)	Biome-BGC	Process-based	Net primary productivity	A1B, A2, B2	2100	2a,2b,2c (in supplementary material)
	Reeves et al. (2017)	MC2	Process-based	Cover	A1B, A2, B2	2100	3a,3b,3c (in supplementary material)
	Reeves et al. (2014)	Biome-BGC	Process-based	Net primary productivity	A1B, A2, B2	2100	4a
Pinyon-Juniper	Cole et al. (2008)	Multiple quadratic logistic regression	Statistics-based	Presence	Generic CO_2 doubling	2100	5
	Jiang et al. (2013)	CNDV	Process-based	Presence	A2	2100	5b
	McDowell et al. (2015)	CESM	Process-based	Cover	RCP 8.5	2090	4h
	Notaro et al. (2012)	LPJ-GUESS DGVM	Process-based	Cover	A2FIXCO2, A2, B1	2100	4d,4j,4p
	Rehfeldt et al. (2012)	Random forest	Statistics-based	Presence	A2, B1, B2	2090	3h,3i,3o,3p,3s,3t
Sagebrush	Renwick et al. (2018)*	Spatial correlations fit with random forest	Statistics-based	Cover	RCP 4.5, RCP 8.5	2100	N/A
	Renwick et al. (2018)*	Temporal correlations fit with mixed effects model	Statistics-based	Cover	RCP 4.5, RCP 8.5	2100	N/A
	Renwick et al. (2018)*	Seedling survival model	Process-based	Seedling survival	RCP 4.5, RCP 8.5	2100	N/A
	Renwick et al. (2018)*	LPJ-GUESS DGVM	Process-based	Cover	RCP 4.5, RCP 8.5	2100	N/A
	Schlaepfer et al. (2012)	Ensemble SDM fit to climate	Statistics-based	Presence	B1/A2	2090	3a,3b
	Schlaepfer et al. (2012)	Ensemble SDM fit to ecohydrology	Statistics-based	Presence	B1/A2	2090	3c,3d
	Still & Richardson (2015)	Random forest	Statistics-based	Presence	A1B	2050	1

Species - vegetation component modeled; Study – study containing model; Model type – broad model categorization; Modeling method – statistical method or specific model used; Indicator – measure of species performance modeled; Emissions scenario – CO2 emissions scenario or representative concentration pathway used to predict climatic changes; Time of projection – the latest time to which models were run; Fig. – which figure in original study showed results*Results from Renwick et al. (2018) are supplemental results obtained from authors.

BLM Resource Management Plans

Lastly, we systematically analyzed all 44 BLM Resource Management Plans within the IMW published between 2001 and 2017, to determine the extent to which these legally binding plans consider and provide adaptation strategies for climate change. We downloaded plans from BLM's website (https://eplanning.blm.gov/epl-front-office/eplanning/lup/lup_register.do, accessed in February 2019; Table S3).

We analyzed of BLM plans in two phases. First, we coded for keywords associated with climate change. To do so, we used NVivo to search each plan for the presence of the following keywords: "climate," "warming," "extreme," "weather," "greenhouse gas," "global," "IPCC" and GHG" (Table S2, Appendix I). Keywords were paired down from a longer phrase (e.g. "climate change," "global warming," "warming temperature," or "global extremes.") and left in the singular form so as not to exclude other variations of these words that refer to climate change. When a keyword was found, the whole paragraph to which it belonged was selected and coded as containing that keyword. If the word was found in a table, the whole table was selected, unless the table included paragraphs within it, in which case the relevant paragraph was selected and coded. This process was repeated for each keyword in each plan. Although the Record of Decision for Resource Management plans were occasionally provided with plans, we did not code these because such sections are not part of the legally binding plan that authorizes management actions.

In the second phase of coding, we used NVivo to read and analyze the relevant content of the saved sections. We read each of the selected sections, noted the context and essence of how climate change was discussed, and grouped statements by topic. We removed any sections that did not explicitly mention or discuss climate change. Finally, we compared our synthesis of the

literature with BLM management plans to determine whether the plans and literature address similar concerns regarding climate change impacts on multiple uses. All plans and NVivo files used for analysis can be found on Hydroshare.

5. Results of Systematic Literature Review

Our initial Scopus search resulted in 7,122 peer-reviewed articles. Of these, 841 contained at least one land use in the abstract (Fig. 3). From this subset we identified 280 articles published from 2009-2017 with annual citation rates of 2 or greater, and 74 articles published in 2018, for a total of 354 recent and cited land use articles (Fig. 3). Of these, 253 included study areas within the IMW, and 225 of this subset mentioned climate change in the body of the text. These 225 articles serve as the dataset for our systematic literature review.

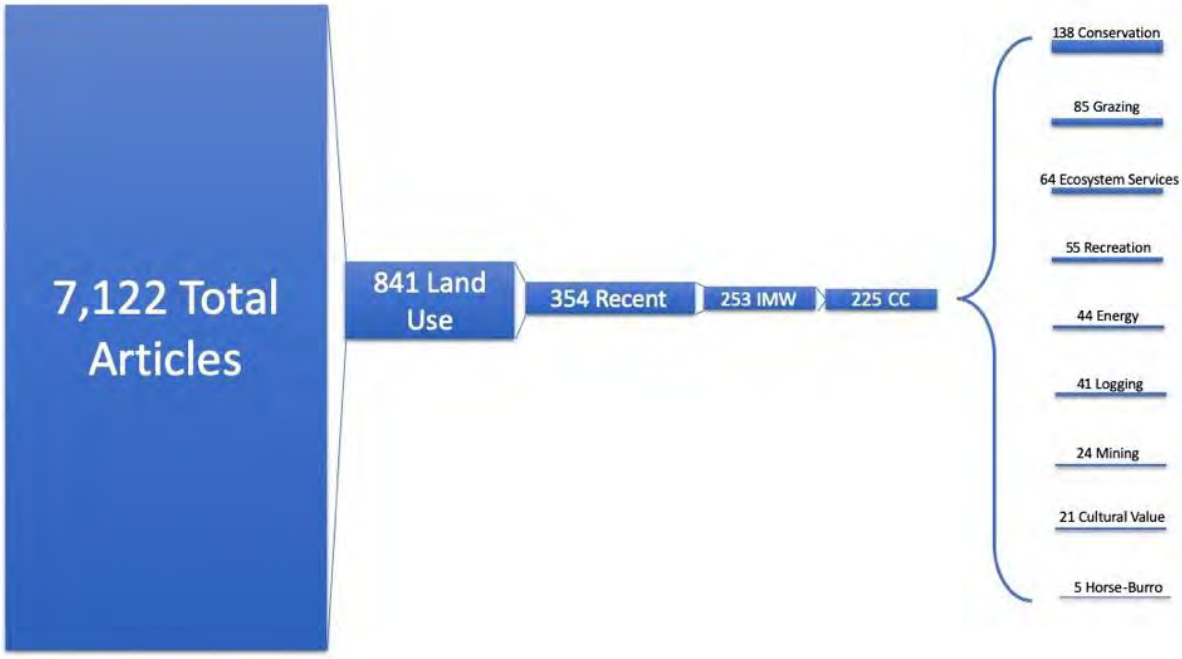

Figure 3. Flow chart of the article selection process. From left to right: all articles produced from the initial Scopus search; articles from the Scopus search with at least one land use in the abstract; articles published between 2009-2018 with at least two citations per year; articles within the IMW; articles that explicitly mention climate change in the body of the text; number of articles for which each land use appears in the body of the text.

BLM was mentioned in 18% of articles, but was only a substantial focus of 1% of the articles. When BLM was mentioned explicitly, it was typically as a data source, or was mentioned as the managing agency of the study area. Explicit management recommendations were also uncommon. While 80% of articles mentioned management of public lands, it was often only alluded to in a generic sense in a single sentence. For example, "These results will be useful to help direct management decisions and prioritize restoration activities for imperiled [Colorado River Cutthroat Trout] populations in the face of a changing climate" (Roberts et al. 2017, p. 1384). This lack of actionable recommendations in the academic literature reaffirms the oft-reported gap between academic research and on-the-ground land management activities (Archie et al. 2012, Davenport and Anderson 2005, de Groot et al. 2010, Leahy and Anderson 2010).

Our systematic literature search was targeted to identify recent and periodically cited articles directly relevant to our research questions. While it was not intended to be a complete, exhaustive search of every paper that could be relevant to land management in the IMW, several important insights emerged. First, the literature related to climate change and land management in the IMW is vast and diverse. Even within the relatively rigid constraints of our automated search, we encountered a tremendous number of relevant insights regarding observed or foreseeable impacts of climate change on uses for which BLM manages. A comprehensive list of these insights is available in supplementary information, and key findings are reported below.

Second, a few uses for which BLM manages are afforded considerably more attention than others in the academic literature. Of the 225 papers identified, conservation and grazing were the most frequently mentioned land uses (138 and 85 articles, respectively; Fig. 4). Recreation (55), energy development (44 articles), and logging and timber (41) were less frequently mentioned, and mining (24), cultural values (21), and wild horses and burros (5) were

rarely found within the article text. When discussed, they were often only briefly mentioned, or discussed as a threat to conservation and ecosystem services. Historic value was not found in any article.

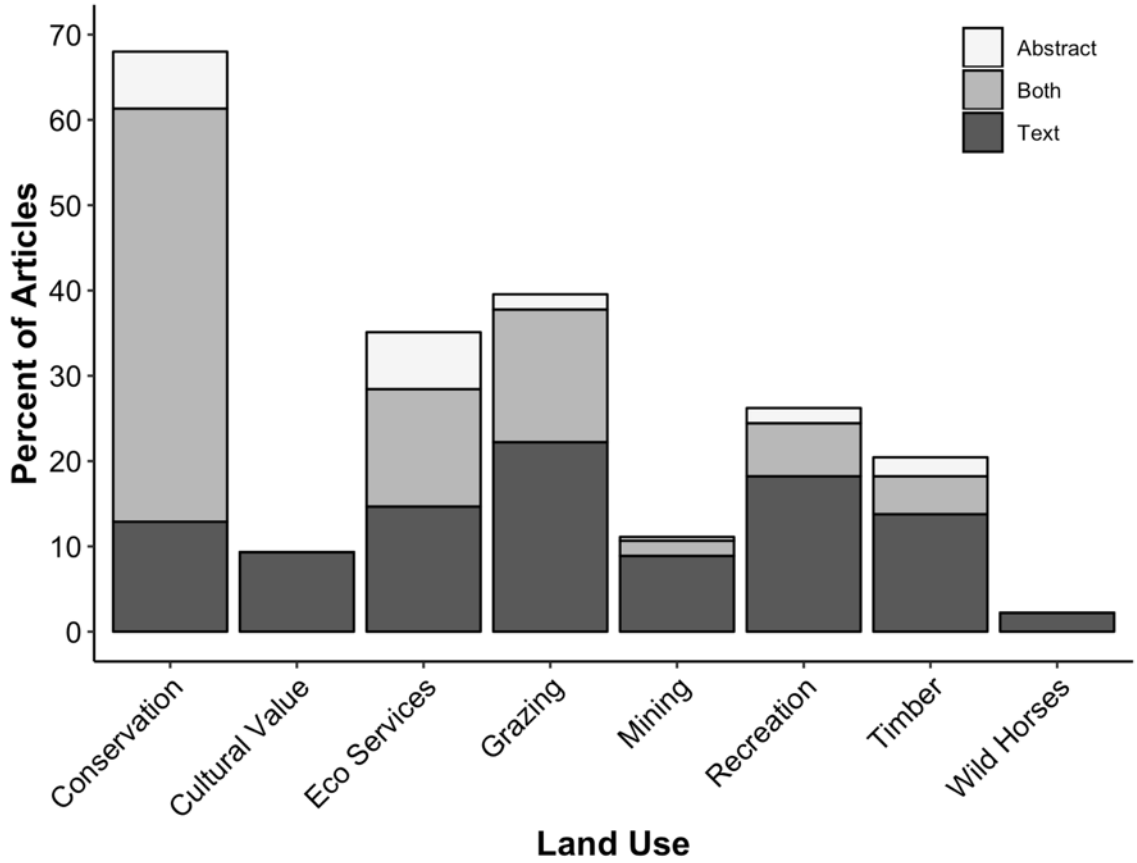

Figure 4. The percent of articles in which each land use was found. The lightest gray denotes that the land use was only found in the abstract of the paper, the darkest gray denotes that it was only found in the body of the text, and the middle gray means the land use was found in both the abstract and the body of the text.

The majority of papers focused on one (39% of articles) or two (20%) land uses and avoided addressing the challenges of interacting and potentially conflicting land uses. Of those studies that investigated interactions among multiple uses, the most prominent theme was that the more active and extractive uses (e.g., energy development, grazing, recreation) threaten the more passive uses (e.g., conservation, ecosystem services, cultural value). For instance, grazing can increase sediment runoff (Warziniack et al. 2018), degrade bird habitat (Friggens and Finch

2015), and promote pinyon-juniper expansion, which negatively impacts small mammal communities (Rowe et al. 2010). Additionally, energy development, large wildfires, exotic grass invasion, conifer expansion, conversion to cropland, and urban/exurban development all threaten sagebrush and the 350 species that rely on sagebrush ecosystems (USFWS 2013, Chambers 2017). These land use and ecosystem changes may exacerbate expected negative impacts (or offset positive impacts) of climate change on sagebrush. Similarly, combined effects of climate change and recreation have contributed to the decline of the snowy plover, a short-distance migratory bird (Thomas et al. 2012). Timber harvest has reduced habitat quality for redband trout, with 89% of this species' habitat at high risk of loss from land use (Muhlfeld et al. 2015). Livestock grazing, off-highway vehicles and energy development disturb soils and can increase dust loading 10- to 40-fold, which negatively impacts plant growth, causes numerous respiratory and cardiovascular disorders, and reduces the runoff efficiency of melting snowpack (Duniway et al. 2018).

Furthermore, the combined impacts of climate change and active land uses may have significant deleterious effects on ecosystem services and ecological function. Copeland et al. (2017) found, for example, that reduced abundance and diversity of native species in the Colorado Plateau was mostly due to the combined effects of climate change, population growth, recreation, oil and gas development, renewable energy, and agriculture. Roberts et al. (2017) found the effects of brown trout invasion combined with climate change imperiled more populations of cutthroat trout than climate change alone.

In contrast to land uses as threats, a second theme in the literature was that some land uses may actually help preserve others. For instance, grazing was mentioned as a tool to limit wildfire and invasive species, and ultimately preserve biodiversity and ecosystem function.

Davies et al. (2016) found grazing during winter can reduce fine fuels and, therefore, reduce wildfire likelihood, thus improving sage grouse habitat conservation. Similarly, Nafus and Davies (2014) determined low to moderate grazing, compared to no grazing, may increase the ability of a community to resist invasion from medusahead (a low forage value grass) following fire disturbance. However, it is difficult to support general conclusions about effects of grazing on ecosystem service because grazing effects are extremely variable at the local scale, reflecting variation in grazing intensity and seasonality and the biotic and edaphic context.

Our automated search did not find a single paper supporting the notion that climate change does not pose a major threat to BLM ecosystems and the services and products for which those lands are valued, although there were several inconclusive articles. This null finding supports earlier executive and secretarial orders for federal agencies to consider climate change in their planning and to reduce their own greenhouse gas emissions. Further, this null finding stands in contrast to the 2017 revocation of those former orders, which occurred without acknowledgement of the threats posed by anthropogenic climate change.

The vast majority of papers were published in journals that require a subscription or other charge for access. However, while we did not have information regarding copyright and sharing status of each article, the articles and abstracts could all be accessed using public search engines (e.g., Google Scholar) and could likely be obtained free of charge by personal communication with the corresponding author.

6. Foreseeable changes in BLM ecosystems

The vast majority of papers identified in our systematic literature review examined recently observed or foreseeable changes in BLM ecosystems. We highlight findings from many of those key papers in this section and augment those findings with additional papers that did not

meet our strict search criteria (e.g., because they did not explicitly mention a land use in the abstract or were not published between 2009-2018), but nevertheless provide useful insights regarding climate change impacts on the IMW ecosystems managed by BLM. We provide an in-depth analysis of predicted vegetation change because vegetation plays a central role in many of the uses for which BLM manages, and also provide a summary of foreseeable impacts to other components of BLM ecosystems in Table 3.

Climate change impacts on vegetation

Plant species composition and productivity determine the quantity of forage for livestock and wildlife and the quality of wildlife habitat, and influence other ecosystem services, including soil fertility and carbon storage, nutrient cycling, fire regimes, and recreation (Havstad et al. 2007). Predicting how climate change will alter vegetation, through alterations in temperature, precipitation and carbon dioxide (CO_2) concentrations, is critical for long-term land management planning.

Our quantitative review of predictions from vegetation models showed a high degree of consistency in the direction of predicted change for sagebrush, pinyon-juniper and forage production (Fig. 5). Models project significant ($p < 0.05$) increases in sagebrush distribution or abundance in the Northern Basin and Range and Wyoming Basin, significant ($p < 0.01$ or $p < 0.05$) decreases in pinyon-juniper in the Central Basin and Range, Colorado Plateau, and Northern Basin and Range, and significant ($p < 0.01$ or $p < 0.05$) increases in forage production in all ecoregions. These results do not address the magnitude of change in a region.

Projected changes in cheatgrass were less consistent. On average, decreases were more common than increases, especially in the Northern Basin and Range (Fig. 5) but this trend was not clearly significant ($p = 0.09$). [SZ1]

We found only slight differences when comparing high emissions and low emissions scenario results (Fig. S1, Appendix I). In fact, we found more variability due to model type (Fig. S2, Appendix I) than emission scenario, indicating that uncertainty about ecological processes is larger than uncertainty about the impacts of varying magnitudes of climatic change.

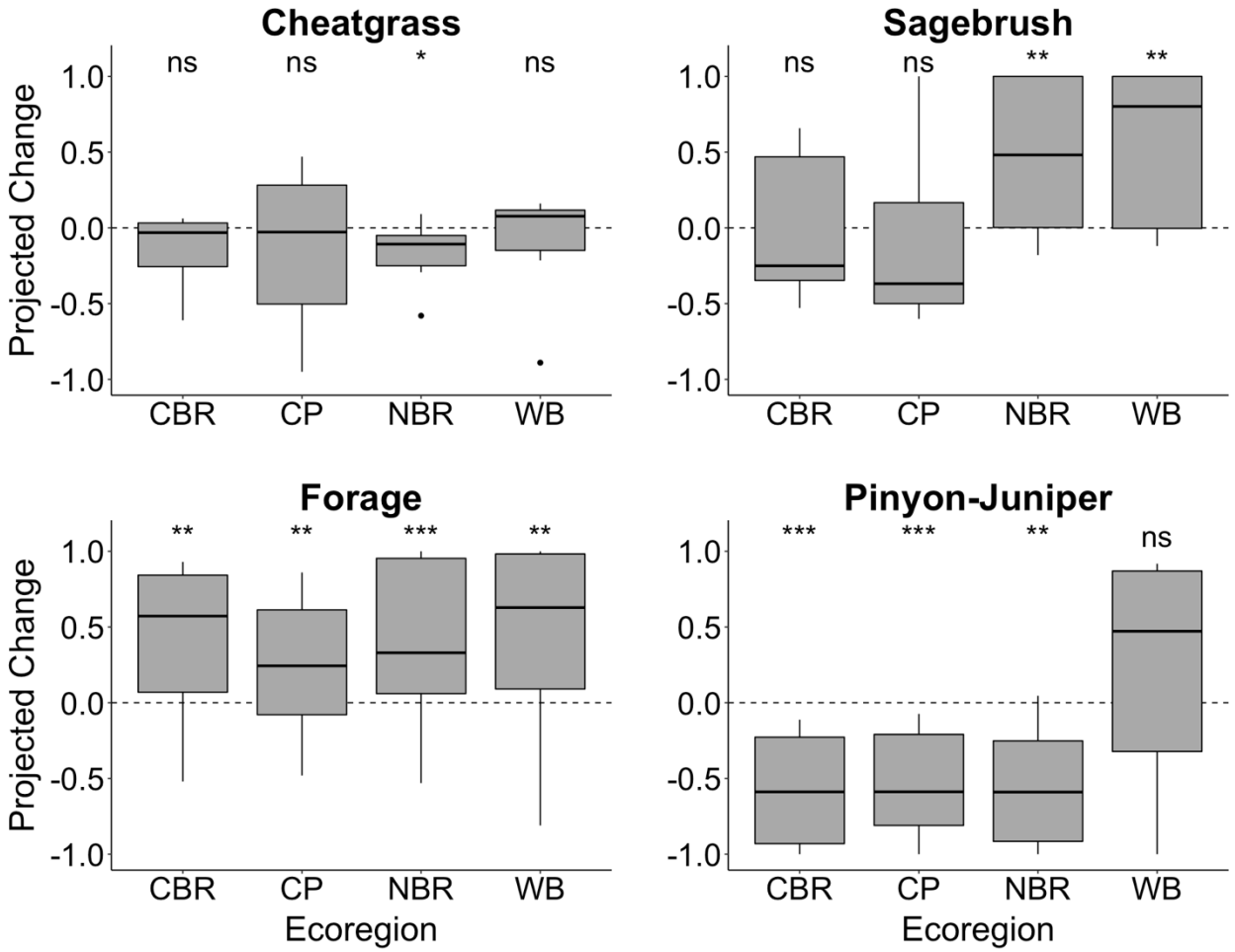

Figure 5. Projected changes within ecoregions important to BLM management, with results from all emissions scenarios and model types grouped. CBR=Central Basin and Range, CP=Colorado Plateau, NBR=Northern Basin and Range, WB=Wyoming Basin. Stars denote statistical significance: *** $p < 0.01$, ** $0.01 < p < 0.05$, * $0.05 < p < 0.20$, *ns* $p > 0.20$.

The high degree of consistency in the predicted impacts of climate change on vegetation means our results may be useful for land-management planning. For example, the BLM has devoted considerable resources to fighting increases in pinyon-juniper density and distribution

for decades (Redmond et al. 2013). Predicted declines in pinyon-juniper suggest BLM may be able to reduce costly pinyon-juniper management in the future. Predicted increases in forage production are also good news for land managers, implying greater capacity of BLM lands to support livestock and wildlife populations. Finally, the predicted sagebrush increases in the Northern Basin and Range and Wyoming Basin may provide opportunities for restoration and conservation. In contrast, predicted declines in sagebrush in southern regions suggest restoration strategies targeting no net loss of sagebrush in these regions may be infeasible, especially under high emissions future scenarios.

For cheatgrass, model predictions were less consistent. The lack of clear increases may be encouraging for land management agencies. However, cheatgrass predictions strongly depend on precipitation seasonality (Bradley 2009), which is notoriously difficult to predict with current climate models. Additionally, even if cheatgrass suitability declines in the future, other invasive annual grasses such as medusahead (*Taeniatherum caput-medusae*) and red brome (*Bromus madritensis ssp. rubens*) could potentially fill its niche (Snyder et al. 2019).

The most important caveat to our results is that most of the models we reviewed do not consider the effects of future changes in wildfire regimes. Climate change is expected to increase the size, frequency and severity of fires in the IMW (Liu et al. 2013, Barbero et al. 2015, Abatzoglou and Williams 2016, Murphy et al. 2018, Prudencio et al. 2018). The predicted increases in forage that we found may also increase wildfire risks. Increases in fire could cause greater declines in pinyon-juniper (Allen et al. 2015, McDowell et al. 2016) than the models predict, and could lead to decreases, rather than increases, in sagebrush (Reeves et al. 2018). Conversely, fire might cause greater increases in cheatgrass than shown in our results (Bradley et al. 2018, Larson et al. 2018).

Foreseeable impacts on other ecosystem processes

Climate change is predicted to affect many other ecosystem processes, characteristics and services. A comprehensive summary of those changes goes beyond what is feasible in this effort, and is highly dependent on greenhouse gas emissions over the next several decades. However, Table 3 summarizes some of the foreseeable impacts to critical characteristics, processes and services provided by BLM ecosystems.

Table 3. Commonly documented impacts of climate change across the Intermountain West

Category	Impacts	References
Biological Soil Crust	Change to community structure and function	Blay et al. (2017); Root et al. (2011); Washington-Allen et al. (2010)
	Warm/dry climates host late successional species and have more nitrogenase activity	Schwabedissen et al. (2017); Norton et al. (2011); Shaw et al. (2019)
Mammals	Distribution shifts poleward or upslope	Lynn et al. (2018); Rowe et al. (2010).
	Decline in some species abundance (e.g., bats, pika, small mammals)	Beever et al. (2016); Hayes & Adams (2017); Rowe & Terry (2014)
	Habitat loss	Malaney & Cook (2013); Mathewson et al. (2017); Beever et al. (2016)
	Chronic heat stress	Mathewson et al. (2017)
	Changes in food sources and animal activity	Butler (2012)
Birds	Decreased recruitment, fecundity, survival, range (e.g., spotted owl, sandhill crane, snowy plover, crossbill, sagegrouse)	Blomberg et al. (2014); Brown & Bachelet (2017); Gerber et al. (2015); Peery et al. (2012); Thomas et al. (2012).
	Loss of habitat (e.g., band-tailed pigeons, songbirds, sagegrouse)	Coxen et al. (2017); Friggens & Finch (2015); Homer et al. (2015); Schrag et al. (2011); Shirk et al. (2017).
Fish	Decline in coldwater species habitat	Isaak et al. (2015); Roberts et al. (2017); Young et al. (2016)
	Expansion of invasive species (e.g., brown trout)	Budy & Gaeta (2017)
	Hybridization	Young et al. (2016)
	Distribution shifts	Gresswell (2011)
Aquatic Ecosystems	Warmer and more variable thermal/hydrologic conditions	Al-Chokhachy et al. (2013); Isaak et al. (2012); Gresswell (2011); Leppi et al. (2012); Muhlfeld et al. (2015); Roberts et al. (2013); Strecker et al. (2011)

	Prone to larger, more frequent disturbances	Isaak et al. (2012); Fesenmyer et al. (2018); Rudolfsen et al. (2019)
	Increased wildfire further warms streams	Isaak et al. (2018)
Water Availability	Decrease in water availability due to increased evapotranspiration, altered precipitation patterns, reduced snowpack, and changes in timing of spring runoff	Perry & Praskievicz (2017); Sanderson et al. (2012); van Mantgem et al. (2009)
	Decreased ground- and surface water	Formica et al. (2014); Perry & Praskievicz (2017)
	Increased conflict over water	Sanderson et al. (2012)
Dust	Damage to vegetation, Reduced snowpack and water supply, increased nutrient loading to aquatic ecosystems, respiratory and cardiovascular impacts on humans and animals	Duniway et al. (2019)
Discordant shifts in phenology	Advanced cheatgrass phenology	Boyte et al. (2016)
	Accelerated flowering dates	Munson & Sher (2015)
	Montane systems may experience more rapid changes in phenology	Munson & Sher (2015)
Wildfire	Increased fire frequency	Embrey et al. (2012); Hansen & Phillips (2015); Hurteau et al. (2014); Palmquist et al. (2018)
	Fuel dries earlier in year, lengthening fire season	Hurteau et al. (2014); Rocca et al. (2014)
	More high severity fires and mega-fires	Davies et al. (2016); Hurteau et al. (2014)

7. Climate Change Impacts on Multiple Uses

Determining the impacts of climate change on specific uses for which BLM manages is particularly challenging because there are a variety of pathways by which climate change may evolve, those pathways may impact land uses in different and non-linear ways, and we do not know all of the thresholds and interactions within the ecosystems on BLM lands that climate change may affect. Generally, uncertainties regarding these thresholds and interactions are elevated under more fossil fuel-intensive pathways and are increasingly relevant for longer-term predictions. In this section, we dig deeper into foreseeable impacts of climate change on specific

uses for which BLM manages, drawing from literature that includes and extends beyond the papers identified in our systematic literature review. Table 4 summarizes climate change impacts on BLM land uses as well as interactions among land uses.

Table 4. Climate change impacts on and interactions between various land uses for which the BLM manages.

Land Use	Climate Change Impacts	Land Use Interactions
Conservation	• Distribution shifts upslope • Changes in abundance • Increased threat of invasive species • Habitat loss	• Grazing negatively impacts small mammal communities and causes habitat degradation • Energy development displaces wildlife • Timber, grazing, mining reduce habitat quality for fish
Ecosystem Services	• Decreased water availability in summer • Poor air quality due to wildfire and longer pollen seasons • Decreased ability of forests to sequester carbon	• Pressure on water from mining, grazing, and energy development • Grazing can cause loss of streamside vegetation and increased erosion • Oil and gas extraction can contaminate groundwater
Cultural Value	• Increased disturbances damage historic sites • Traditional practices and knowledge may erode	• Loss of natural characteristics of spiritual and cultural significance due to recreation, oil and gas, and grazing • Threatened by increased recreation (particularly motorized)
Recreation	• Overall increase in outdoor recreation participation • Lower elevations become unsuitable for snow-based recreation • Extreme summer temperatures dampen recreation • Sites with highly valued natural characteristics (e.g., glaciers) may have lowered visitation rates if threatened	• Managing for nonmotorized recreation may complement biodiversity and wildlife management, but conflict with timber and mining • Oil and gas extraction diminishes natural qualities valued by visitors • High potential of overlapping in area with oil and gas • Potential increases in motorized recreation may negatively impact other recreational, extractive, and conservation uses through increased dust and damage to biocrusts

Grazing	• Overall increased rangeland productivity due to increased temperatures and longer growing seasons • Low-elevation, low-moisture sites may have reduced productivity	• Grazing can reduce fire frequency/severity and invasive species • Negatively affect wildlife • Can damage riparian vegetation and stream quality • High potential of overlapping in area with oil and gas
Wild Horses & Burros	• No information in literature, likely same as for grazing	• No information in literature • May overlap with livestock grazing
Timber & Logging	• Minimal effects, but overall long-term decline in timber production • Primary sensitivity is to increased incidences of wildfire, insects, and disease associated with climate change • Accelerated root disease	• Can affect stream quality and wildlife habitat • Thinning can reduce wildfire risk, clearcutting can increase wildfire risk
Mining & Energy Development	• Increased mudslides and fires may threaten infrastructure • Will be most affected by policies aiming to reduce GHG emissions	• Can contaminate groundwater • Causes reduced abundance and diversity of native species • Contributes to loss of natural qualities associated with recreation • High potential of overlapping in area with recreation and grazing • Threatens nutrient cycling and sediment transport

Conservation

The Federal Land Management and Policy Act of 1976 (FLPMA), which established the nation's BLM public lands policy, declares "the public lands shall be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resources, and archeological values, that, where appropriate, will preserve

and protect certain public lands in their natural condition' [and] will provide food and habitat for fish and wildlife and domestic animals. …" (43 U.S.C. 1701, Sec. 102). Thus, the BLM's legal authority requires a variety of conservation activities that can protect a wide range of values. Doing so will depend to a large extent on the agency's capacity to retain key vegetative communities in a changing climate. This review has found numerous threats to vegetation and wildlife that may arise due to climate change, thereby posing significant challenges to BLM's ability to achieve its conservation mandate.

Predicted vegetation changes include shifts from shrub-dominated systems to invasive annual grassland where cheatgrass, medusahead and ventenata become established (Bradley, 2009, Ziska et al. 2005), from shrub-dominated to conifer woodland in other locations where there is pinyon-juniper encroachment (Balzotti et al. 2016), and from grassland to shrub-dominated in the Chihuahuan Desert grasslands of New Mexico (Caracciolo et al. 2016). All three circumstances have negative implications for maintenance of important plant communities and associated wildlife. In particular, climate-driven vegetation change threatens big sagebrush (*Artemisia tridentata*), the most widely distributed species within the study region and the dominant plant species throughout most of its range. Research suggests climate change is likely to have direct negative effects on big sagebrush survival and recruitment in the hottest part of its current range, but have only weak impacts, or perhaps even positive ones, in cooler parts of the IMW (Kleinhesselink and Adler 2018). Declines in the extent of big sagebrush communities is predicted to have significant negative impacts on a wide range of wildlife and plant species that depend on those communities for all or part of their life cycles (Coates et al. 2016, Davies et al. 2011).

An important factor in the conservation of vegetation communities at the landscape to regional scale is BLM's geographic position within the region. Generally speaking, BLM lands occupy lower-elevation landscapes while higher-elevation lands are managed by the USDA Forest Service. Except in eastern Washington, BLM land tends to be contiguous with or even surrounding national forests. Thus for some species, even if plant and/or animal communities disappear on BLM land due to changes in temperature and precipitation, upslope shifts in distribution may allow those communities to persist on Forest Service land. However, such shifts also are likely to lead to new interactions among species that shift upslope and those that persist in more montane areas. Without knowing which species are able to shift distributions and which will persist, it is not possible to predict how upslope movement from BLM to Forest Service lands may affect conservation of species and communities that experience range shifts due to climate change. In any event, it likely would constitute a FLPMA violation for the BLM to abandon efforts to conserve at-risk habitats simply because those habitats are encroaching on adjacent Forest Service land.

Conservation of rangeland soils is likely to become more difficult in a changing climate. Models suggest an increase in net primary productivity (NPP), and thereby the potential for soil carbon sequestration, in parts of the IMW but decreases in NPP elsewhere (Boone et al. 2018). Where NPP decreases as is predicted in southern and western parts of the region, carbon sequestration will likewise decrease. Further, increased bare soil leads to carbon losses due to erosion. Where NPP increases, the potential for improved soil carbon sequestration exists, however, gains may be offset by increased wildfire activity. For example, while some scientists and policy makers have suggested increasing pinyon-juniper woodland cover will lead to increased organic carbon storage, research suggests woodland expansion has limited potential for

below-ground organic carbon storage, and any benefits must be weighed against the increased risk of wildfire and subsequent annual grass invasion (Rau et al. 2011).

Protection of aquatic species on BLM lands in a changing climate is likely to depend on the reliability of water sources and streamflows. Although some climate projections suggest an increase in precipitation, droughts are predicted to be more frequent and last longer (Snyder et al. 2019), increasing the chance that seeps and springs will periodically go dry, with negative consequences for aquatic species. Increased wildfire events and subsequent erosional processes likewise have negative implications for aquatic species conservation.

Livestock and Grazing

BLM manages 115 million acres of rangeland, most of which is in the IMW (Warziniack et al. 2018), making grazing management an important component of BLM duties. Livestock grazing on public lands is a complex issue with myriad environmental factors influencing livestock and numerous impacts, both beneficial and detrimental, of livestock on the environment (Rojas-Downing et al. 2017, Henry et al. 2012).

Impacts of warmer temperatures are known with the highest certainty, and hence the direct impacts of warmer temperatures on livestock and forage are most predictable. Future increases in temperature and changes in precipitation regimes will have direct impacts on livestock in terms of heat stress and reductions in water quantity and quality. The vulnerability of livestock to heat stress depends on species and breed, life stage, and nutritional status, but generally heat stress has been shown to reduce reproduction (Nienaber and Hahn, 2007), compromise metabolic and digestive functions (Mader 2003, Bernabucci et al. 2006, King et al. 2006), reduce weight gain (Mitloehner et al. 2001), and increase mortality (Sirohi and Michaelowa, 2007). While changes in precipitation regimes are more difficult to predict, future

climate scenarios consistently predict a reduction in snowpack and runoff, as well as increased duration and severity of drought. These predicted trends imply a reduction in water availability for livestock grazing on BLM land, and less reliability of water from year to year. Further complicating the problem, livestock tend to require considerably more water under warmer conditions. Most cattle grazing on BLM public lands are of European-origin breeds within the species *Bos taurus,* which have been found to require 3, 8, and 14 kg of water per kg of dry matter consumed at ambient temperatures of 10, 30, and 35 ºC, respectively (Thornton et al. 2009). Because tropical cattle breeds in the genus *Bos indicus* require less water (Thornton et al. 2009), as do certain *B. Taurus* breeds of Spanish and South American origin (Anderson et al. 2015), efforts are under way to identify and/or develop breeds that are better adapted to more arid landscapes. However, public-land livestock producers may find it difficult to switch to smaller, more water-efficient breeds in a beef supply chain geared toward a uniform product despite variations in forage conditions (Spiegal et al. 2018).

Climate change is also likely to impact livestock grazing on public lands indirectly in numerous ways, including changes in the quantity, quality and location of available forage, degraded air quality, increased transmission of diseases, and changes in the timing and distributions of pests. Generally, warmer temperatures, a lengthened growing season, and increased precipitation are expected to increase primary productivity of rangelands in the IMW, particularly in more northern latitudes (Halofsky et al. 2017, Warziniack et al. 2018). However, in some parts of the IMW primary productivity increases may accrue primarily to non-native annual grasses such as *Bromus tectorum* that lose palatability in summer and increase risks of catastrophic wildfire, which reduces local forage availability for several years (Blumenthal et al. 2016). Additionally, CO_2 increases may alter the relative abundance of grassland plant species

by increasing the production of a single species without affecting the biomass of others (Warziniack et al. 2018). Such changes, however, are more likely at higher elevations, with low-elevation, moisture-limited areas potentially facing reduced productivity (Halofsky et al. 2017).

Warmer temperatures, which stress cattle and reduce weight gains, and the potential for increased forage variability could make grazing management more challenging in the future, even if total forage quantities increase (Reeves, Bagne, and Tanaka 2017). Furthermore, increased inter-annual variability in forage requires more flexibility from range managers, but BLM grazing policies tend to constrain such flexibility. Climate change is also likely to affect pests, pathogens, hosts, vectors and epidemiological pathways that afflict livestock (Thornton et al. 2009, Tabachnick, 2010, Mills et al. 2010). However, these effects are difficult to predict due to the heterogeneous and non-linear nature of epidemiological phenomena, and especially when environmental conditions controlling pathogens and pests can change rapidly under altered environmental conditions, such as during a flood or drought.

Grazing may also be impacted by national policy on greenhouse gas emissions. While we are not aware of a comprehensive estimate of greenhouse gas emissions from livestock on public lands in the US, livestock have been estimated to be responsible for 10% of total greenhouse gas emissions in Australia (Henry et al. 2012) and 8-15% of global emissions. Some studies have estimated emissions associated with livestock to be considerably higher (Goodland and Anhang 2009, Gerber et al. 2013). Thus, policy or economic changes that reduce supply and demand for livestock may be an indirect feedback pathway that influences grazing on public lands in the near future.

Recreation

There is a clear disconnect between the scientific understanding of the impacts of climate change on lands managed by the BLM and the agency's awareness and use of that research. Research from social and economic sciences has identified several dominant pathways in which climate has, and will continue, to impact outdoor recreation participation and management (Hand et al. 2018). The first of these pathways, referred to as direct impacts, involves the effects of warming temperatures and more variable precipitation on the behaviors of outdoor recreationists themselves. The second pathway involves indirect effects in which outdoor recreationists' behaviors change in response to impacts to the biogeophysical characteristics of outdoor recreation settings.

For most outdoor recreation activities on BLM lands in the IMW, direct impacts involve rising temperatures, which will tend to make weather conditions more enjoyable; this is expected to lead to an increase in outdoor recreation participation. BLM lands facilitate over 65 million outdoor recreation visits per year (Cline and Crowley 2018) with most of those visits occurring in the warm summer months (U.S. Department of the Interior 2019). Numerous studies have shown visitation is positively correlated with warming temperatures (Fisichelli et al. 2015, Askew and Bowker 2018, Smith et al. 2019). Rising temperatures extend shoulder seasons earlier into the spring and later into the fall, resulting in more outdoor recreation destinations becoming accessible for longer portions of the year. The demand for warm-weather activities, which include hiking, camping, motorized recreation and mountain biking will likely increase on BLM lands in the future (Hand et al. 2018).

Given the warm temperate and already arid climates of BLM lands, some regions might experience reductions in outdoor recreation participation rates during mid-summer, when temperatures exceed comfortable thermal conditions. Previous research has documented the

relationship between outdoor recreation participation levels and temperatures switches from positive to negative when mean daily high temperatures exceed 27-30ºC (Fisichelli et al. 2015, Hewer et al. 2016, Smith et al. 2018). Mid-summer temperature-driven declines in participation are likely to occur in the extreme southwestern portions of Utah and southeastern Nevada, as well as the lower-elevation regions of Arizona and New Mexico. However, these regions will still likely experience increasing annual participation as the shoulder seasons expand.

Indirect impacts of climate change on outdoor recreation participation are pervasive, affecting nearly every activity offered on BLM lands. Hunting, fishing and wildlife viewing opportunities provided by the agency are particularly vulnerable to these indirect impacts. Over half (4.2 million) of all wildlife associated recreation trips to BLM lands occur in the IMW (Southwick Associates 2018). As the availability and abundance of targeted species change in response to warming temperatures, it is highly likely participation in wildlife-related outdoor recreation will shift accordingly. Previous research suggests hunters and anglers are willing to substitute hunting/fishing sites and may even substitute other outdoor recreation activities if they are no longer able to target specific species (Hand et al. 2018). Previous analyses, however, suggest any reduced participation in hunting, angling and wildlife viewing attributable to target species being negatively impacted will be outweighed by the direct and positive effects of longer summer seasons (Askew and Bowker 2018).

Although existing research on the impacts of climate change on outdoor recreation opportunities on BLM lands is sparse, the existing literature suggests participation in outdoor recreation on BLM lands will continue to increase for the foreseeable future. With temperatures rising, more and more people are likely to seek out, and engage in, outdoor recreation opportunities on lands managed by the agency. Outdoor recreation opportunities on BLM lands

already make a notable contribution to the nation's economy; the Department of Interior estimates the direct economic contribution at over 3.33 billion USD (U.S. Department of the Interior, Office of Policy Analysis 2018). Between 2015 and 2017, the total economic contribution of outdoor recreation opportunities provided by BLM lands grew by 12%; by comparison the total economic contribution of oil, gas and coal over the same period grew by only 3% (U.S. Department of the Interior, Office of Policy Analysis 2016, 2018). While increased recreational pressures may exacerbate conflicts with other uses for which BLM manages, including conservation and cultural/historical preservation, increased revenues derived from recreation on BLM lands could potentially offset future declines in revenues from extraction of fossil fuels and minerals.

Other BLM land uses likely to be impacted by climate change

Climate change impacts on cultural and historical values of BLM resources are very seldom discussed in the literature. However, climate change poses a threat to cultural and historic values in two main ways, through damaging historic sites and altering traditional ways of life. First, increased disturbance due to climate change, such as floods and wildfire, have the potential to irreversibly damage historic sites. Second, the lifestyles and traditions of many Native American communities are likely to be threatened by climate change. For example, traditional foods may be affected by climate change through habitat alterations and changes in the abundance and distribution of species, which often results in the erosion of traditional practices and knowledge (Warziniack et al. 2018). Additionally, there may be accelerated loss of natural characteristics of cultural and spiritual significance. Furthermore, adaptive capacity is low, suggesting that such traditions and ways of life will be challenging to preserve.

Of the 225 articles coded in our systematic literature review, there was no mention of wild horses and burros in relation to climate change. Despite the lack of peer-reviewed literature on this topic, the effects of climate change on these species may be expected to be similar to that of livestock and grazing. That is, rangeland productivity may increase overall across the IMW, suggesting a potential benefit to wild horses and burros. As these species are largely considered to be nuisances with negative environmental impacts, a potential increase may exacerbate conflicts with other uses, including conservation and recreation.

Climate change is expected to profoundly influence the spatial and temporal patterns of drought, wildfire and invasive species distributions, all of which may impact forest health and, therefore, timber harvest operations. While the literature seldom discusses direct linkages between climate change and timber harvest, numerous papers document recent and future predicted shifts in tree species viability (Buma and Wessman 2013, Hansen and Phillips 2015, Iglesias et al. 2015, Yang et al. 2015, Shinneman et al. 2016, Stevens- Rumann et al. 2018), increased frequency and severity of wildfire (Wu et al. 2011, Macfarlane et al. 2013) and increased spread of invasive pests and diseases (Embrey et al. 2012, Weed et al. 2013, Shanahan et al. 2016, Halofsky et al. 2017, Warziniack et al. 2018). Increases in temperatures and CO_2 could result in increased forest productivity and biomass accumulation, resulting in greater timber productions at higher elevations (Halofksy et al. 2017). However, long-term decreases in moisture availability and increased disturbances will likely reduce forest growth and reproduction at low elevations, and potentially shift the ranges of important timber species (Halofksy et al. 2017, Parmenter et al. 2018). Warmer winters and a shift to more rain-dominated systems may increase forest road erosion and landslides, making winter harvest more expensive, and ultimately reducing the timer supply (Halofsky et al. 2017). These additional uncertainties,

limitations, and costs represent formidable challenges for the already diminished timber industry in the IMW.

8. How is BLM planning for climate and environmental change?

Of 44 total plans, only 17 mentioned climate change in any capacity (Table S3, Appendix I). In general, references to climate change are vague, with very few specific predicted impacts or management considerations. There are a few exceptions, such as plans developed by the Tres Rios, Dominguez-Escalante, Lakeview, Burns, John Day and Vale offices. Tres Rios, for instance, directly links climate change and extreme weather with increased outbreaks of insects and diseases threatening vegetation, habitat loss for wildlife, aspen decline, threats to riparian vegetation, drought, and biodiversity loss.

Furthermore, plans very rarely examine the impacts of GHGs, climate change, or poor air quality and focus instead on monitoring or minimizing fugitive emissions from BLM land. For example, the Tres Rios plan directly links GHGs with energy extraction stating, "greenhouse gases should not be vented from existing wells and should achieve at least 95% emission reduction." While other plans may mention GHGs, they do not typically link production of GHGs with specific land uses, nor do they offer specific rules or regulations. Similarly, the Socorro, New Mexico plan mentions GHGs but states: "It is not possible at this time to predict with any certainty the local or regional effects of this RMP's proposed actions on climate," (pg. 10). This statement is striking for two reasons: 1) it complies with the 2001 mandate "to consider" climate change but completely abstains from taking actionable responsibility and 2)

when the plans do mention climate change the emphasis is on mitigation rather than adapting to climate change. In any case, sections 5 and 6 describe myriad impacts of greenhouse gas emissions, with many other impacts predicted globally. Impacts that can be directly attributed to BLM lands could reasonably be estimated as the proportion of emissions from BLM-derived fossil fuels relative to total global emissions. While it is beyond the scope of this review to put a dollar value on those impacts, a large and growing literature is working to quantify the social cost of greenhouse gas emissions (Nordhaus 2017, Havranek et al. 2015, Yang et al. 2018).

Almost none of the plans actually discuss BLM efforts to adapt to climate change impacts. The John Day field office plan is one of the very few exceptions (Table 5) listing specific actions that could minimize the impact of climate change on sage grouse.

Of those that do consider the impact of climate change on BLM lands and uses, the most commonly discussed were wild horses/burros, domestic or wildlife grazing, and energy development and extraction. The Price, Utah plan, for instance, discusses grazing in relation to climate variation:

> "During times when extreme climatic conditions exist, the BLM will manage and adjust grazing practices to maintain and work toward meeting Standards for Rangeland Health for Public Lands in the PFO, see Appendix R-7" (pg. 99, emphasis added).

However, since extreme climatic conditions exist without anthropogenic climate change, this statement does not necessarily endorse the reality of climate change or the need for adaptation strategies.

We evaluated BLM RMPs because those are the legally binding documents that govern all BLM management actions under FLPMA. While we found very few mentions of climate change and adaptation strategies, it is possible that BLM is able to adapt to climate change to some extent using the management practices and philosophies described in the plans, while not

explicitly linking them to climate change. For example, field offices generally reserve the ability to increase or decrease grazing densities according to forage availability and conflicts with other uses, both of which may change under future climate regimes. In other cases, by excluding consideration of climate change in some plans BLM may be setting themselves up for failure. For example, several BLM plans establish a principle of no net loss of sage brush, which may not be feasible in some regions under future climates. It is also possible that BLM is attempting to adapt management for climate change using other mechanisms, such as the Rapid Ecoregional Assessments (https://landscape.blm.gov/geoportal/catalog/REAs/REAs.page). However, given that FLPMA requires management actions to be articulated in the RMPs, it is unclear if or how new or different management needs that emerge from the REAs could be implemented under existing RMPs. Lastly, we acknowledge the development and approval process for RMPs takes a considerable amount of time, often requiring 6 to 10 years. While the 17-year time period for which we analyzed plans should have been sufficiently long for most plans to have explicitly included consideration of climate change, some of the plans may have been too far along in the process to be modified when the 2001 mandate was issued. In any case, the time consuming and arduous task of developing and modifying RMPs calls into question whether the existing RMP framework is appropriate for adaptive management that will clearly be needed in the future.

Table 5. All references to climate change in BLM Resource Management Plans.

Plan	Year	Reference to Climate Change
Taos, NM	2012	Identify potential GHG sources and sinks
John Day Basin, OR	2012	Discusses impact of climate change on: changes in wintering elk; sage-grouse population and habitats (and possible listing of sage-grouse); rangeland vegetation. Discusses monitoring and adaptation for sage-grouse and rangeland vegetation
Carson City, NV	2001	Monitoring and adjusting livestock and wild horse numbers to adjust to "trends in… climatic data"
Winnemucca District, NV	2015	Monitor forest health/disease (whitebark pine) early warnings to respond to climate change
Socorro, NM	2010	Discusses GHGs and vulnerability of federal land to "wide range of effects from climate change, some of which are already occurring" but doesn't specify and claims it's impossible to predict "RMP's proposed actions on climate"
Price, UT	2008	Adjust grazing practices due to "extreme climatic conditions"
Vernal, UT	2008	Found in references but not plan
Canyons of The Ancients, CO	2010	Require use of green mobile well completion equipment for oil and gas wells to "prevent venting of saleable gas and other air pollutants"; Also in references
Colorado River Valley, CO	2015	Reduce GHG emissions associated with construction and industrial activities
Grand Junction, CO	2015	"Minimize emissions, within the scope of BLM's authority; protect watershed health impacts from "climate variability"
Tres Rios, CO	2015	Associates climate change with extreme weather, insects/diseases, habitat loss, aspen decline, threats to riparian vegetation, drought, and biodiversity loss; Links GHGs with energy extraction specifies required reductions
Dominguez-Escalante National Conservation Area	2017	Discusses climate trends as impetus for new RMP; require oil and gas activities to submit comprehensive inventory of anticipated direct and indirect GHG emissions
Lakeview, OR	2003	Mentions "climate-driven stresses" in management objectives of "Late-Successional Reserve," specifically mentioning wildfires and spotted owl recovery
Burns District Office, OR	2005	Climate change has negative effect on soil crusts, also discusses climate change contributing to increasing wildfire severity that threatens riparian vegetation resilient to climate variation
Vale Field Office, OR	2002	Mentions "climatic data" in regards to wild horses and domestic grazing [ten mile seeding project], and vegetation management
Cody, WY	2015	Discusses paleoclimate change; mentions "both natural and anthropogenic" GHGs

9. Implications of climate change for multiple use management of BLM land

Although natural resource managers are concerned about climate change, many are unable to adequately plan for it (Daniels and Walker 2012, Murphy et al. 2015, Wyborn et al. 2015). Challenges for multiple use public land management in a changing climate include disconnects between managers and academic researchers (Lane 2001), 'siloing' of disciplinary scientific knowledge (Flint 2007, Howarth and Monasterolo 2017), lack of awareness or inability to implement management changes based on current scientific knowledge (van Riper et al. 2012, Cheng and Randall-Parker 2017), lack of clarity over different management mandates (Hardy Vincent, Hanson, and Argueta 2017), conflicts inherent in the management of multiple uses of public land (Cuba et al. 2014, Fleming et al. 2015, Oppio et al. 2015, Rudestam 2014, Wulfhorst et al. 2006, Wilson 1997), and the general uncertainty of climate change at spatial and temporal scales relevant to management (Wyborn et al. 2015). Furthermore, the lack of social drivers and/or social change into modeling efforts and general lack of consideration of social outcomes of management decision making constrains management (Beckage et al. 2018, Givens et al. 2018).

The BLM's mandate is "to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations" ("About," 2016). Although the BLM is effectively the nation's largest landlord (Skillen 2009), this mandate has proven to be difficult to enforce as there is no guidance on how to prioritize different uses when the uses either conflict with one another or threaten the health, diversity or productivity of the public lands (Hardy Vincent, Hanson, and Argueta 2017). Furthermore, BLM field offices have to consider all secretarial orders, congressional mandates and executive orders that apply to federal lands managed by the BLM, as well as work with state and county officials (Ross 2006). This results in the BLM struggling to comply with many different mandates, which opens the BLM to

lawsuits and litigation. For instance, in the past year the BLM has been sued in Wyoming, Colorado and Utah for failing to incorporate climate change into its oil and gas leasing process (Kohler 2019, Passut 2019, Randall 2019).

Although the BLM has historically resisted action that would detract from its "flexibility" in decision-making (Glicksman and Coggins 2001), in 2014 the agency recognized the need for more science in their planning due in part to climate change, and attempted to implement that change among others in 2016. Although the BLM Implementation Strategy asserts there are "numerous examples [of specific project and field offices]… in which the BLM is effectively embracing science-land management integration," these authors assert more consistent practice throughout the BLM is needed in order to be more consistently effective as an organization in the future (Schadegg 2017). Towards this effort, the BLM finalized an attempt to reform their planning processes, the Resource Management Planning Rule, in 2016. This rule was intended to increase the amount of science incorporated into BLM management.

However, in 2017, the US Congress utilized the oversight authority granted to them via the 1996 Congressional Review Act to repeal the BLM's attempt to improve their own planning process (McEnany 2017). On March 27th, 2017 when President Trump signed the joint resolution overturning the Resource Management Planning Rule, former Interior Secretary Zinke issued a memo to the BLM indicating the BLM should instead increase the flexibility of the agency to operate at state or local scales in order to reduce litigation and actually reduce "duplicative and disproportionate [scientific] analyses" (Zinke 2017). Contrary to those findings, our results suggest that, at least in the context of climate change, more explicit incorporation of science is indeed necessary for effective natural resource management in a climate change-affected future.

The science-management gap identified in our study is problematic, as our results support previous findings that climate change will likely increase land use conflicts (Johnson and Becker 2015) and that most human land uses and/or values are fundamentally threatened by climate change (Chambers and Wisdom 2009). In particular, passive uses are under-prioritized by the BLM due to an institutional focus on active and anthropocentric uses (Loomis 2002). Several studies indicate these passive uses need greater consideration (Beschta et al. 2013, Koontz and Bodine 2008).

10. Management Recommendations

While the US government has thus far failed to develop a comprehensive policy on climate mitigation or adaptation, public land management agencies acknowledge the imperative. In a survey of BLM and US Forest Service (USFS) managers, the vast majority of respondents thought climate change science was useful for their work (90%), for future planning efforts (97%), and for specific management projects (80%), and a large majority (80%) agreed strongly that using climate change science is within their job description or responsibilities (Kemp et al. 2015). In 2008, the USFS, which also manages public lands for multiple uses, asserted that "without fully integrating consideration of climate change impacts into planning and actions, the Forest Service can no longer fulfill its mission" (Dillard et al. 2008). Although both the BLM Resource Management Plans and academic literature emphasize the uncertainty of climate change and the need for more research, the literature offers some explicit management recommendations that may benefit BLM.

Climate Refugia

Many articles, particularly those regarding wildlife, suggested protecting climate refugia as a way to manage conservation under climate change. Climate refugia are areas that are buffered from the effects of climate change, and are thus valued as habitat for many threatened species. Such areas include locations with cold-air pooling, valley bottoms, gorges, north-facing aspects and riparian corridors (Beever et al. 2016, Curtis et al. 2014). Beever et al. (2016) identified Craters of the Moon National Monument in Idaho as a potential refugia for pika, for example. Similarly, Isaak et al. (2015) identified cold-water habitat in Idaho that is projected to remain so in 2080 as potential refugia for salmonids. Additionally, Friggens and Finch (2015) determined that the land around Elephant Butte and Caballo reservoirs in New Mexico, much of which is BLM land, are important climate refugia for several bird species. BLM may consider placing higher protective status on areas that serve as climate refugia.

Adaptive Grazing and Restoration

Specific management recommendations regarding grazing were focused on limiting the effects of grazing on other land uses, rather than adapting to climate change. Such recommendations include shorter grazing periods, long post-grazing recovery and rest periods, as well as enclosures to keep livestock out of sensitive areas (Halofsky et al. 2017). To adapt to increasing wildfire potential, a common recommendation was to use prescribed burns and mechanical thinning to decrease the fuel load (Halofsky et al. 2017), which would both protect ecosystem services provided by forests and grasslands, as well as timber and logging activities.

There are several recommendations for managing vegetation under climate change. First, to restore and revegetate landscapes, one recommendation is to plant drought-tolerant species (Halofsky et al. 2017). Another recommendation is to use climate forecasts to determine when and where planting is most likely to result in successful seedling establishment (Copeland et al.

2017). A more novel approach is to increase species and genetic diversity through plantings, which could increase resilience to climate change (Halofsky et al. 2017).

Protecting Cultural Values

Warziniack et al. (2018) provides suggestions for maintaining cultural values under climate change. First, they recommend increasing resources for law enforcement and preservation of cultural sites to mitigate expected damage. They also suggest using traditional ecological knowledge, which has helped tribes adapt to ecological change in the past. Additionally, Warziniack et al. recommend the use of vegetation management near high-risk cultural and historic sites to combat fire, floods, erosion and the establishment of non-native species.

11. Improving communications in the science-management-policy nexus

Our research demonstrates a wealth of literature regarding climate change impacts in the IMW. Yet, the stark disparity between the literature and management plans highlights a disconnect between academics, managers and policymakers. To bridge this gap, scientists need to make their research more accessible and could make greater efforts to include more explicit and thorough management recommendations. At the same time, managers and policymakers need to make stronger efforts to access and more fully incorporate information from the scientific community. Here, we have provided a synthesis of the science from over 200 articles, which can be used as a starting point for managers to incorporate climate change science into their land management planning. Furthermore, the data collected for this project provides a list of DOIs for all the literature outlined here (available on Hydroshare), which can facilitate the incorporation of such science into management practices and plans. But fundamentally

improving communication within the science-management-policy nexus will require realignment of incentives in academia, management agencies and funding agencies to acknowledge the value of more meaningful interactions.

12. Permitting extraction of fossil fuels on BLM land

Of all the potential management implications of this research, the obvious, paradoxical problem is the continued extraction of fossils fuels on land managed by the BLM. Based on Secretarial Order 3226 (2001), the BLM needed to consider contributing to climate change in their land management plans, although this requirement was revoked in 2017. As noted in our analysis of BLM land management plans, some field offices did restrict extraction of fossil fuels, as these activities inevitably contribute to anthropogenic climate change. However, due to the way FLPMA was written, the BLM also has to manage for legacy land uses, including energy extraction (Ellenwood et al. 2012). Thus, in the context of anthropogenic climate change, energy extraction on BLM land represents a fundamental management conundrum.

Under current rules, the BLM will continue to permit energy extractions, and yet, of all the land uses the BLM manages for, energy extraction contributes the most directly to anthropogenic climate change. Our results highlight some of the major implications of climate change for multiple use management of BLM land, and our recommendations reflect those implications. However, the most direct way the BLM can reduce their contribution to climate change is by reducing permits for energy extraction on BLM land. This reality is reflected by several lawsuits brought against the BLM recently for allowing energy extraction without considering how such actions could contribute to climate change (e.g., Kohler 2019, Passut 2019, Randall 2019). Dealing with these lawsuits is challenging for the BLM, but due to current

management guidelines, the BLM may also face lawsuits from oil and gas companies if they restrict energy extraction. Thus, without major rule changes such as those prosed by the BLM's "Planning 2.0," which congress repealed in 2017, the BLM appears to lack the ability to rectify this issue (McEnaney 2017).

13. Conclusions

Through a systematic review of peer-reviewed literature and analysis of BLM management plans, we have found climate change is likely to negatively impact conservation, ecosystem services, cultural values, timber and logging, energy development, and mining on BLM land. Conversely, recreation and grazing will likely be unaffected or may in some respects be positively affected. The most common theme in the literature was the finding that more active uses of BLM land threaten more passive uses, and climate change is expected to exacerbate these threats in numerous ways. Management should aim to consider the interactions of these land uses in the context of climate change. The BLM will also need to consider both how climate change will affect public land, as well as how the management of public land potentially contributes to climate change. These findings are consistent with the BLM's own findings (Kitchell et al. 2015). However, our research demonstrates there is a lack of: 1) explicit climate change management in BLM plans, 2) a clear directive of land uses and priorities in land use plans, and 3) science on climate change impacts on land uses. This absence may be due in part to our finding that truly interdisciplinary research on climate change is lacking, which may be impeding managers' ability to effectively manage multiple land uses under climate change.

Our study bridges the gap between public land managers and the academic community by identifying what has been identified in the academic literature regarding climate change and comparing it to BLM management plans. Our results detail the existing gaps in the current

literature regarding impacts of climate change on multiple uses of BLM lands in the IMW, as well as a lack of consideration of climate change in BLM management plans. Based on these findings, our research provides actionable management implications for public land agencies to adapt to future environments shaped by climate change.

We also recommend researchers studying the effects of climate change make a more robust effort to understand the reality of public land management in order to communicate their findings effectively. To this end we hope that editors and reviewers strongly encourage a more robust description of 'management implications' when accepting articles regarding climate change that pertain to public land managers. Towards this end we have attempted to disclose some of the challenges currently faced by the BLM in managing for climate change. Currently, the rules and guidelines that dictate how the BLM manages public land do not provide adequate direction on how to manage for climate change. Thus, these results support the BLM Advancing Science Integration Strategy Team's recommendations of "incorporating best available science" and the agency's recent efforts to modernize their own planning guidelines.

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16. Appendix I: Supplementary Tables and Figures

Table S1. Terms used in Scopus searches to identify articles that contained *both* a climate change and IMW identifier in the title, abstract, or keywords.

Climate Change	Intermountain West		
Climat*	Great Basin	*Mountain West	Oregon
Global Warming	Colorado Plateau	Arizona	Washington
Temperature Change	Rocky Mountains	Colorado	Wyoming
Environmental Change	Sagebrush Steppe	Idaho	Utah
Extreme event	Greater Yellowstone	Montana	western US
	Bureau of Land Management	Nevada	western United States
	BLM	New Mexico	

Table S2. Terms used to identify climate change in the BLM resource management plans.

Climate Change Identifiers
Climate
Warming
Greenhouse gas
Weather
Extreme
Global
IPCC
GHG

Table S3. The 44 BLM Resource Management Plans analyzed for climate change references.

Plan ID	Region	Field Office	Year
NMF01000	Arizona/New Mexico Plateau	Farmington	2003
NMF02000	Arizona/New Mexico Plateau	Taos	2012
ORP06000	Blue Mountains	Prineville Deschutes	2005
ORP04000	Blue Mountains	John Day Basin	2012
NVC01000	Central Basin and Range	Stillwater	2001
NVW03000	Central Basin and Range	Black Rock	2005
CAN05000	Central Basin and Range	Eagle Lake	2008
NVL00000	Central Basin and Range	Ely	2008
UTC02000	Central Basin and Range	Richfield	2008
NVW00000	Central Basin and Range	Winnemucca	2015
NMA02000	Chihuahuan Deserts	Socorro	2010
IDC02000	Columbia Plateau	Cottonwood	2009
UTC04000	Colorado Plateaus	Kanab	2008
UTY01000	Colorado Plateaus	Moab	2008
UTY02000	Colorado Plateaus	Monticello	2008
UTG02000	Colorado Plateaus	Price	2008
UTG01000	Colorado Plateaus	Vernal	2008
COS07000	Colorado Plateaus	Canyons of the Ancients Visitor Center	2010
CON04000	Colorado Plateaus	Colorado River Valley	2015
COS08000	Colorado Plateaus	Grand Junction	2015
COS01000	Colorado Plateaus	Tres Rios	2015
COS09000	Colorado Plateaus	Dominguez-Escalante (NCA)	2017
ORL05000	Eastern Cascades Slopes and Foothills	Lakeview	2003
CAN02000	Eastern Cascades Slopes and Foothills	Alturas	2008

ORL04000	Eastern Cascades Slopes and Foothills	Lakeview Klamath Falls	2016
NVS02000	Mojave Basin and Range	Red Rock/Sloan Canyon NCA Field Office	2005
AZA00000	Mojave Basin and Range	Arizona Strip	2008
AZA03000	Mojave Basin and Range	Grand Canyon/Parashant National Monument	2008
AZA02000	Mojave Basin and Range	Vermilion Cliffs National Monument	2008
MTB05000	Middle Rockies	Dillon	2006
MTB07000	Middle Rockies	Butte	2009
ORB06000	Northern Basin and Range	Burns Andrews	2005
CAN02000	Northern Basin and Range	Surprise	2008
IDI02000	Northern Basin and Range	Pocatello	2012
IDC01000	Northern Rockies	Coeur D'alene	2007
WYP06000	Northwestern Great Plains	Casper	2007
ORV04000	Snake River Plain	Vale Malheur	2002
IDT01000	Snake River Plain	Jarbidge	2015
CON02000	Southern Rockies	Kremmling	2016
WYD09000	Wyoming Basin	Kemmerer	2003
WYD01000	Wyoming Basin	Pinedale	2008
WYD03000	Wyoming Basin	Rawlins	2008
WYR02000	Wyoming Basin	Cody	2015
CON01000	Wyoming Basin	Little Snake	2016

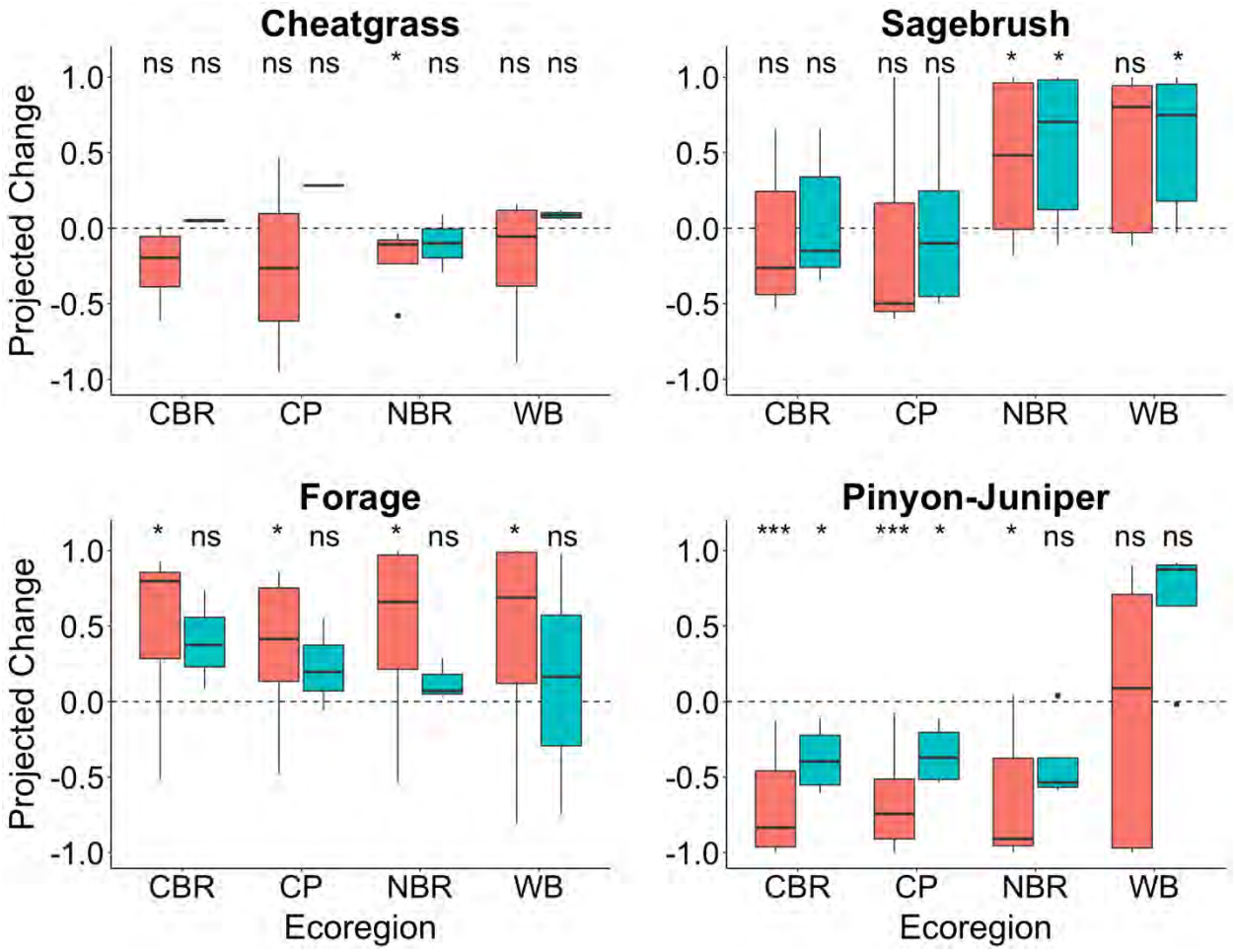

Fig. S1. Projected changes from high (red) and low emissions scenarios (blue) within ecoregions important to BLM management, with results from all model types grouped. CBR=Central Basin and Range, CP=Colorado Plateau, NBR=Northern Basin and Range, WB=Wyoming Basin. Stars denote statistical significance: *** $p < 0.01$, ** $0.01 < p < 0.05$, * $0.05 < p < 0.20$, *ns* $p > 0.20$.

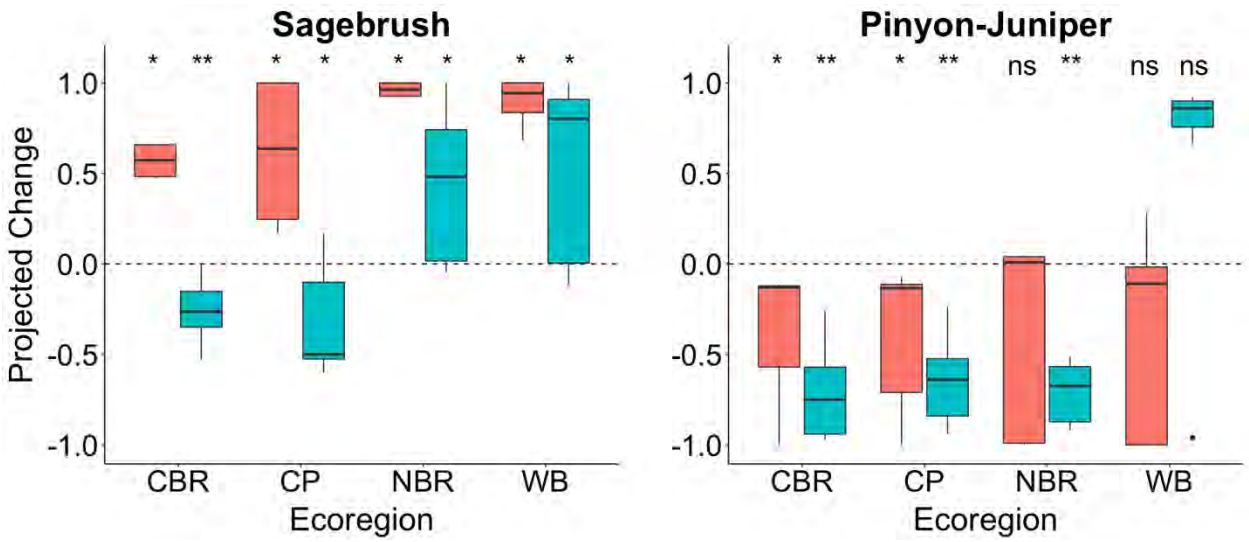

Fig. S2. Projected changes from correlations-based (blue) and process-based models (red) within ecoregions important to BLM management, with results from all emissions scenarios grouped. CBR=Central Basin and Range, CP=Colorado Plateau, NBR=Northern Basin and Range, WB=Wyoming Basin. Stars denote statistical significance: *** $p < 0.01$, ** $0.01 < p < 0.05$, * $0.05 < p < 0.20$, *ns* $p > 0.20$.

17. Appendix II: Qualtrics Coding Survey

For the following questions, please skim through the body of the text, i.e. the text starting at the introduction and going through to the conclusion (including footnotes).

DO NOT INCLUDE ABSTRACT, KEYWORDS, or REFERENCES.

Is the Intermountain West a major focus of the paper based on this map?

This could be the study area or a major area of focus

When in doubt code "yes"

Note:

- Sierra Nevada: exclude if clearly only western slope
- The Cascade Mountains are out. The IMW region begins at the eastern base of the Cascades.
- Great Plains are out, but if a location in the IMW is in the map, then code it as in the IMW (e.g. Cheyenne)
- The Rocky Mountains are in; The IMW region ends at the eastern base of the Rocky Mountains.
- For AZ, the Mogollon Rim is in the IMW. This is the border on the map.

In general, You may need to use Google Maps to clarify.

O No (0)

O Yes - If yes, type in the article's geography in this text box

Climate Change Instructions

Search for "climat" and look for EXPLICIT reference to climate change. This may include "climate variation," "a warming climate," "climate impacts," etc., but it must be in reference to climate change.

If nothing returns then search "warming"

Look for explicit references to a changing climate (not just climatic factors or interannual variation)

Do the authors mention *"climate change" or other climate change identifiers* anywhere in the body of the text?

O No (0)

O Yes (1)

Is there a significant focus on the **impacts of climate change?**

Any consequence of a changing climate, (even if vague) should be coded yes. This information can be anywhere in the body of the text, including the introduction (i.e., doesn't have to be original findings)

Fill in the text box for the climate change impacts discussed. A quote is fine.

O No (0)

O Yes (1) _____

FLAG climate for review!

If any of the climate questions are unclear, click this

☐ FLAG CLIMATE (1)

Describe flagged climate issue

Does the paper discuss **management of public lands or land uses?**

Search for the word “manage” and see if they are talking about implications for management or management efforts. Even if there is only a single phrase regarding management, code "yes" (e.g., "these results have implications for management").

If nothing on management, code no even if you think it might have implications for management

NOTE: This is not about whether or not you think the paper is relevant for managers.

Use the text box to briefly describe the management aspects of the article. A quote is fine.

O No (0)

O Yes (1) _____

Is the phrase "Bureau of Land Management" (or "BLM") found in the body of the text?

Search for “BLM” and “Bureau” and then read to see if it is Bureau of Land Management

This is only for the body of the text. Not the acknowledgments. If you see that BLM is mentioned in the acknowledgments in a significant way, you can write that in the notes box

O No (0)

O Yes (1)

Notes on BLM

_____

FLAG management/BLM for review!

If any of the management/BLM questions are unclear, click this and describe

☐ MANAGEMENT or BLM FLAG (1)

Describe flagged management or BLM issue

Are any of the following land uses found in the body of the text?
Note: LEAVE BLANK if not mentioned at all. If the land use is found only in the title of an organization/group (e.g., "Conservation Lands Foundation"*), leave blank.*

	Yes
Conservation	
Ecosystem Services	
Energy	
Grazing	
Cultural/Historical Value	
Logging/Timber	
Mining	
Recreation	
Wild and/or feral Horse/Burro	
Other	
NONE MENTIONED	

Notes on uses

_____

Are any of the following vegetation types found in the body of the text?

	Yes
Sagebrush	
Cheatgrass	
Grasses/Forage/Grassland	
Pinyon and/or Juniper	
Forests	
Other	
NONE MENTIONED	

As briefly as possible (e.g. 1, 2 or 3 words), what is the topic of the article?

_____

How relevant is the paper to the research question:

What are the implications of climate change on the management of multiple uses on BLM land?

Use this box to describe if and how the paper is relevant to the research question:

_____

Flag for review?

Select this if you were not sure about anything in the coding or if there is something unique or problematic about the article that needs to be resolved. and you HAVEN"T flagged the article already.

Explain the reason for flagging the article:

FLAG! _____

Any other comments on this article?

_____

Exhibit 2:
In the Dark; The hidden climate impacts of energy development on public lands.
The Wilderness Society.

THE WILDERNESS SOCIETY

IN THE DARK

The hidden climate impacts of energy development on public lands

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Appendix 24

Abstract/Introduction

The United States federal government is one of the largest energy asset managers in the world. The Department of the Interior (DOI) manages more than 2.4 billion acres of subsurface mineral rights including energy resources like coal, crude oil and natural gas for the American public. Combined, federal lands account for 42% of all coal, 22% of all crude oil, and 15% of all natural gas produced in the United States in 2015. And over the last decade, the lifecycle emissions associated with these publicly-owned fossil fuel resources amounted to approximately 20% of all U.S. greenhouse gas (GHG) emissions.

There is now a well-established scientific understanding that the global increase in temperature due to greenhouse gas emissions must be limited, at or below 2°C, to avoid unmanageable climate change consequences. Our analysis finds that emissions associated with federal lands energy development need to be reduced from 1.52 billion tons carbon dioxide equivalent (CO2e) per year to between 1.16 billion and 1.13 billion tons CO2e per year by 2025 to be in-line with economy-wide reductions needed to meet that goal. Our analysis concludes that CO2e emissions from federal lands is on pace to exceed these targets by roughly 300 million tons or 25%.

Despite its prominent role, the federal government has done little to inform its shareholders—American taxpayers—about the federal energy program and its associated climate related risks. Limited data on federal fossil fuel resources and production is publicly available, and there is no systematic effort to track nor disclose the carbon consequences of energy leasing on public lands. The lack of adequate information prohibits the public from meaningfully engaging in land management decision processes like resource management planning, lease sales and permitting.

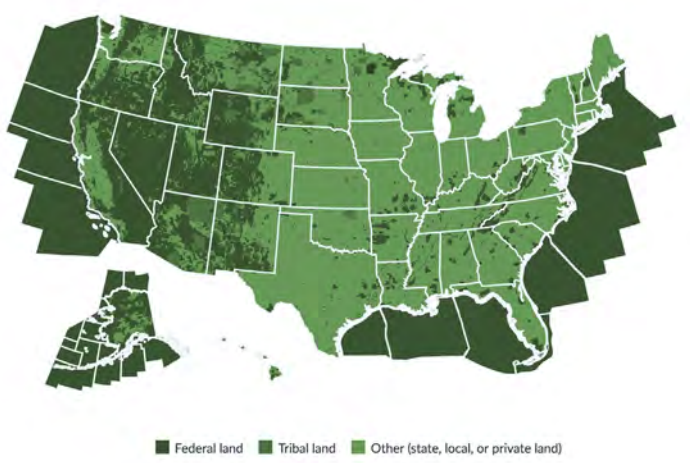
Publicly traded companies are required to disclose certain information, including financial risks, to their shareholders. Although disclosure of climate related risks is not required per se, there is movement in that direction as companies acknowledge the potential financial risks associated with climate change. Studies have estimated the value of capital assets at risk of climate regulation or physical impacts could range from $4.2 trillion to $4.3 trillion by 2100. A lack of adequate information regarding these risks can lead to the mispricing of assets, misallocation of capital and financial instability.

Just as shareholders receive key information regarding financial risk to their portfolios, taxpayers deserve to know how their energy assets are being managed and have a say in the direction of the federal energy program moving forward. DOI should provide the public with easy access to the data needed to make informed recommendations when engaging in leasing and land use planning processes, and to hold the elected (and unelected) managers of their energy assets accountable. Instead, DOI is taking steps to keep this information from taxpayers by discontinuing data sources and withdrawing from important transparency initiatives.

Given the scale of our public energy assets, any meaningful movement towards reducing national GHG emissions must start with the lands over which we have the most discretion. Management of energy development on our public lands can and must be a critical component of any national emissions reduction strategy.

I. The United States manages a tremendous portfolio of energy assets

The U.S. federal government oversees more than 640 million acres of national parks, national forests and other public lands on behalf of the American people. The U.S. Department of the Interior (DOI) manages over 2.4 billion acres of subsurface mineral rights including energy resources like coal, crude oil and natural gas both onshore and offshore.



The Bureau of Land Management (BLM) is responsible for coal leasing on about 570 million acres, and oil and gas leasing on approximately 700 million acres of onshore BLM, national forest and other federal lands, as well as private lands where the federal government has retained the mineral rights.[1,2] The Bureau of Ocean Energy Management (BOEM) oversees approximately 1.7 billion offshore acres on the U.S. Outer Continental Shelf.[3]

In order to facilitate the extraction of coal, oil and natural gas from public lands, BLM and BOEM oversee leasing and development of these resources. At the end of the 2016 fiscal year, private companies held over 40,000 onshore oil and gas leases covering more than 26 million acres and had leased an additional 36 million acres offshore.[4,5] As of 2015, there were 306 coal mines operating on just under 500,000 acres of public land.[6]

Combined, energy extracted from our federal lands accounted for 42% of all coal, 22% of all crude oil, and 15% of all natural gas produced in the United States in 2015.[7] To help put this into perspective, in 2015, coal production from U.S. public lands alone would have ranked 6th in the world, ahead of total production in Russia and South Africa (See Figure 1). That same year, federal natural gas production would have ranked 7th in the world just below production levels in India and Canada but ahead of both Saudi Arabi and Norway, (See Figure 2) and crude oil production would have ranked 13th, barely losing out to Nigeria but well ahead of countries like Qatar and Algeria.[8]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1. https://www.doi.gov/energy/fast-facts
2. https://fas.org/sgp/crs/misc/R42346.pdf
3. Bureau of Ocean Energy Management "Oil and Gas Leasing on the Outer Continental Shelf" Available at: https://www.boem.gov/uploadedFiles/BOEM/Oil_and_Gas_Energy_Program/Leasing/5BOEMRE_Leasing101.pdf
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5. https://www.boem.gov/uploadedFiles/BOEM/Oil_and_Gas_Energy_Program/Leasing/5BOEMRE_Leasing101.pdf
6. https://www.blm.gov/programs/energy-and-minerals/coal/coal-data
7. U.S. coal production data available at: https://www.eia.gov/coal/data.php#production; U.S. natural gas production data available at: https://www.eia.gov/dnav/ng/ng_prod_sum_a_EPG0_FGW_mmcf_a.htm; U.S. crude oil production data available at: https://www.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbbl_a.htm ; Federal production data available at: https://useiti.doi.gov/explore/
8. Federal production from USEITI compared to national production values reported annually in BP's Statistical Review of World Energy available at: https://www.bp.com/content/dam/bp/pdf/energy-economics/statistical-review-2016/bp-statistical-review-of-world-energy-2016-full-report.pdf

Figure 1. 2015 coal production (million tons)

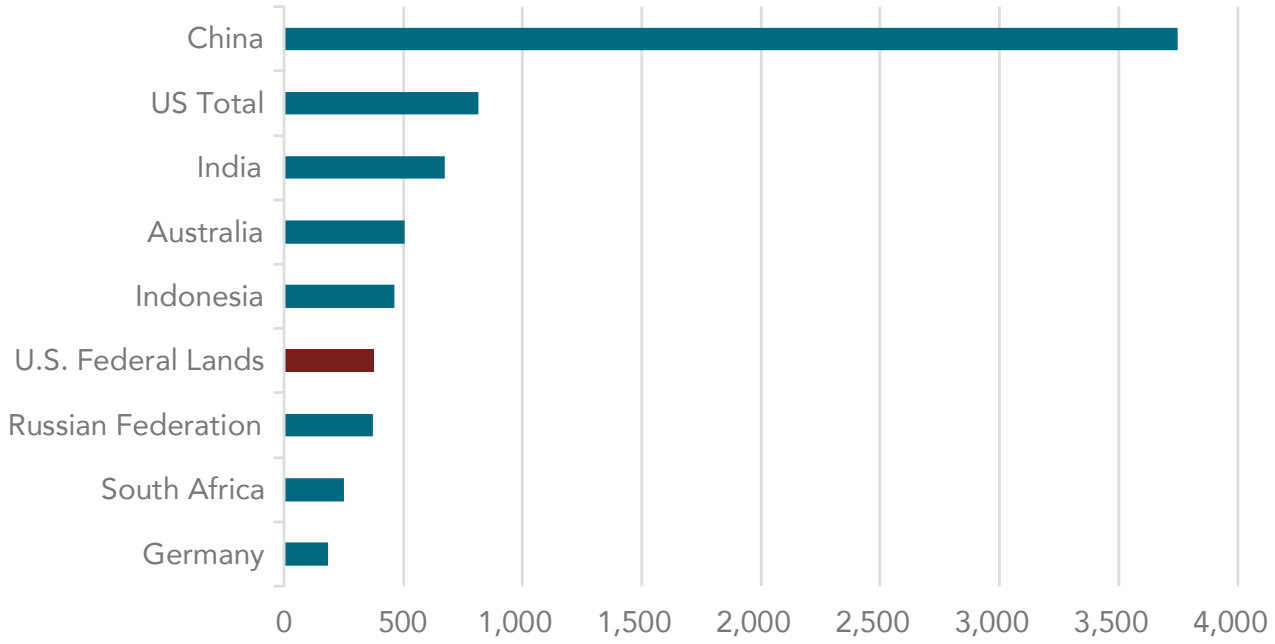
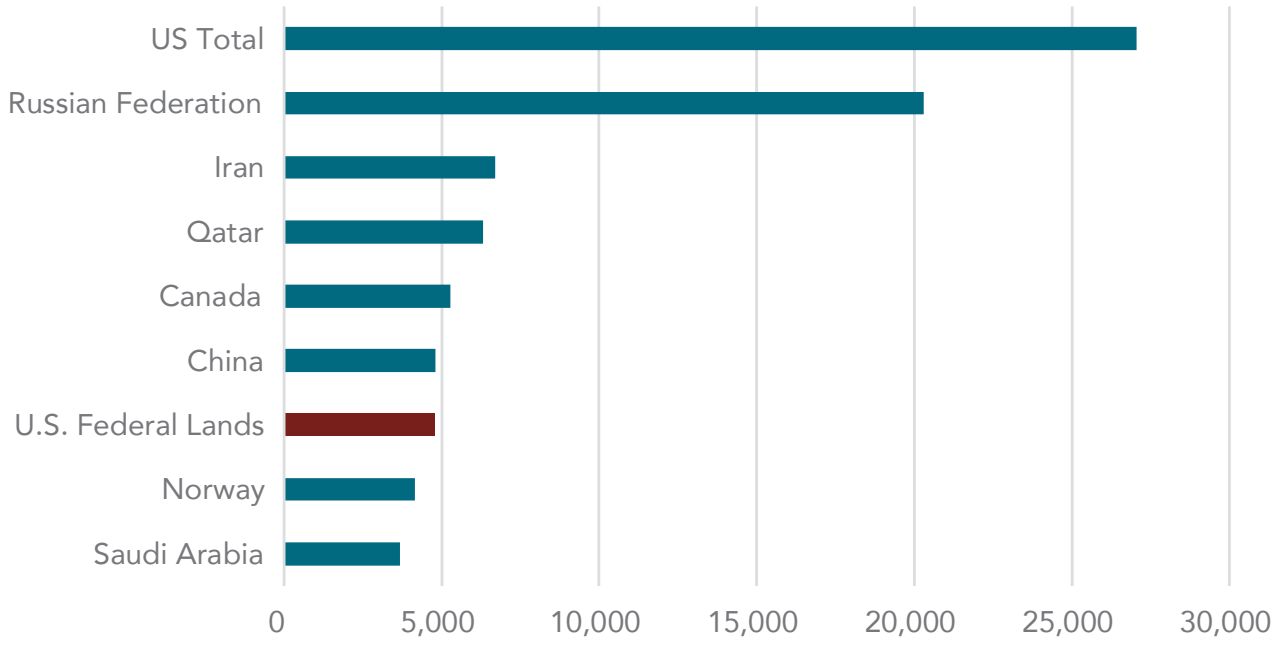


Figure 2. 2015 natural gas production (billion cubic feet)



a. Trends in leasing and production

Over the past fifteen years, total U.S. production of oil and gas has dramatically increased while coal production has plummeted. From 1990 to 2016, total U.S. natural gas production has increased by 52% while crude oil production is up 21%. Coal production however has continued its slow decline, down 22% since 2006 (See Figure 3). The surge in domestic oil and gas production has reduced the nation's reliance on foreign imports of fossil fuels. Natural gas and crude oil imports have declined significantly while exports have increased coming close to eclipsing imports.

The trends witnessed in domestic energy production are largely attributable to a dramatic increase in petroleum production from shale formations, spurred largely by technological advancements in hydraulic fracturing. The increased production associated with the "shale revolution" drove down natural gas prices, providing a cheaper alternative to coal and leading to the increased use of natural gas use in electricity generation.[9] The surplus of oil and gas introduced into the market also helped to move the United States into a position where exports of both have dramatically increased while imports have fallen, setting the country up to become a net exporter of both.[10]

Beginning in 2014, the crude oil market bottomed out. Increased oil production in the United States helped to flood the international market sending crude prices tumbling. However, U.S. producers proved to be quite resilient. Their ability to cut production costs and remain profitable in a low-price environment has allowed U.S. producers to take over a larger market share and increase exports.[11,12]

Development on public lands has been influenced by these same market forces. Crude oil production increased 26% from 2006 to 2015 while coal production dropped 16%. Surprisingly, federal leasing trends have not been a good indicator of production. Federal leasing activity has declined in recent years. Between 1990 and 2015, the total number of acres under lease for coal mining dropped 35% from roughly 730,000 to 482,000 while the amount of land under lease for oil and gas development dropped by 57% from 64 million acres to 27 million acres. Offshore leasing is also down. From 2011 to 2016, the total acreage under lease as well as the total number of active leases had declined by 50%. Despite the declines in total acreage under lease, producing acreage has remained relatively stable, falling only 2% from 1990 to 2016 (See Figure 4).

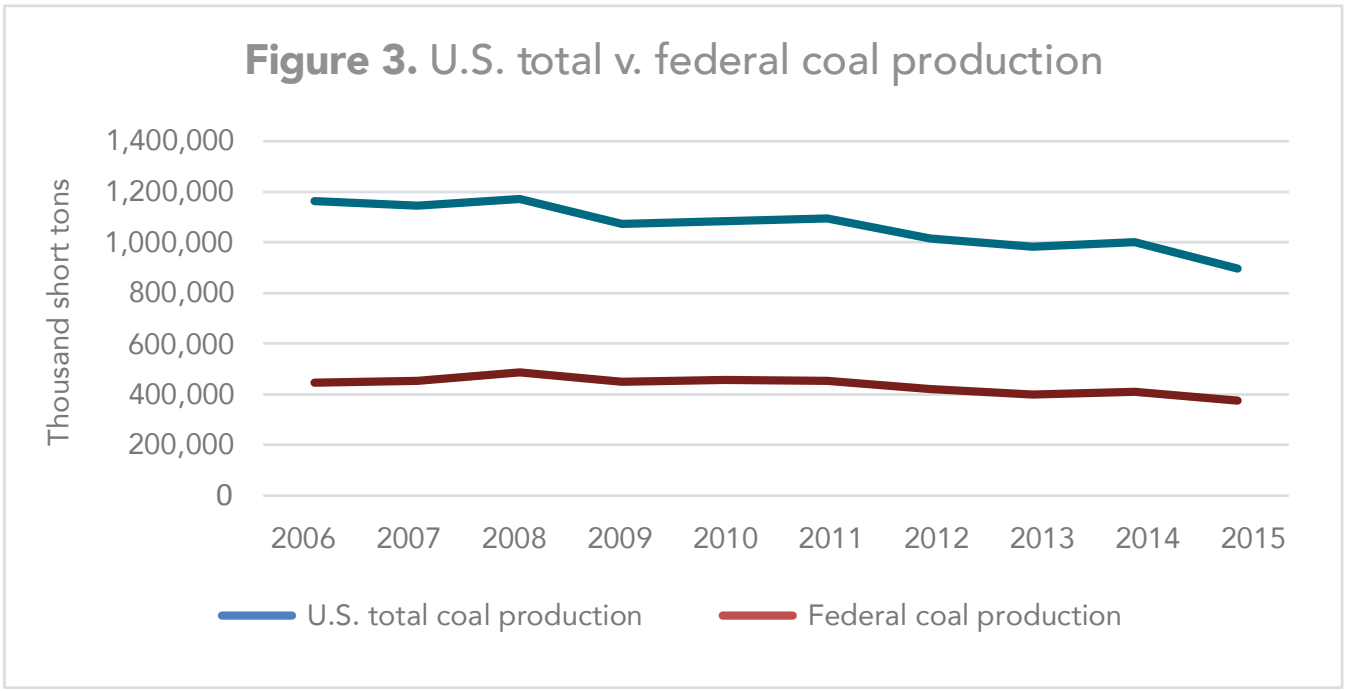
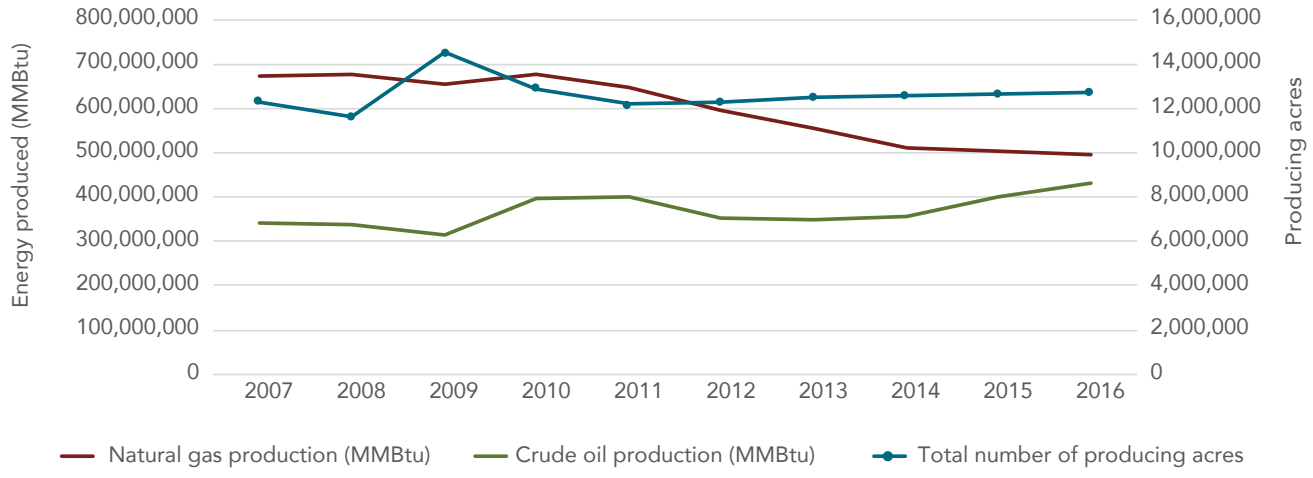


Figure 4. Producing federal acreage v. federal oil and gas production



This shows that U.S. producers have been able to do more with less on public lands. They have increased production with less acreage under lease (See Figure 5). These trends also demonstrate that industry appetite for public lands energy has declined as companies shift development from federal to state and private land. However, this is not due to a lack of availability. In 2015, only 15% of all land offered in lease sales—parcels nominated by industry—was actually purchased. By 2017, only 6 percent of the total acreage offered was actually leased by industry. BLM continues to offer significantly more acreage for lease than industry is willing to purchase (See Figure 6). It is also not due to a lack of access. TWS research shows that 90% of BLM managed subsurface mineral acres are open to oil and gas leasing and of the 27 million acres under lease in 2016, only 12.7 million acres were actually producing energy.[13] That means 14 million acres of publicly owned minerals leased to oil and gas companies were just sitting there. The industry is also sitting on top of 7,950 approved drilling permits that are not being used.[14] In 2016 alone, BLM issued 2,184 drilling permits, of which only 847 were used. In addition to unused permits and non-producing leases, industry is holding approximately 3.25 million acres of federal leases in suspension; meaning an additional 10% of the total acreage under lease nationally is not being put to productive use.[15]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13. The Wilderness Society "Open for Business: How Public Lands Management Favors the Oil and Gas Industry". Available at: http://wilderness.org/sites/default/files/TWS%20--%20BLM%20report_0.pdf
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15. The Wilderness Society "Land Hoarders: How Stockpiling Leases is Costing Taxpayers". Available at: https://wilderness.org/sites/default/files/TWS%20Hoarders%20Report-web.pdf

Figure 5. Despite reduced acreage under lease, federal oil production has increased

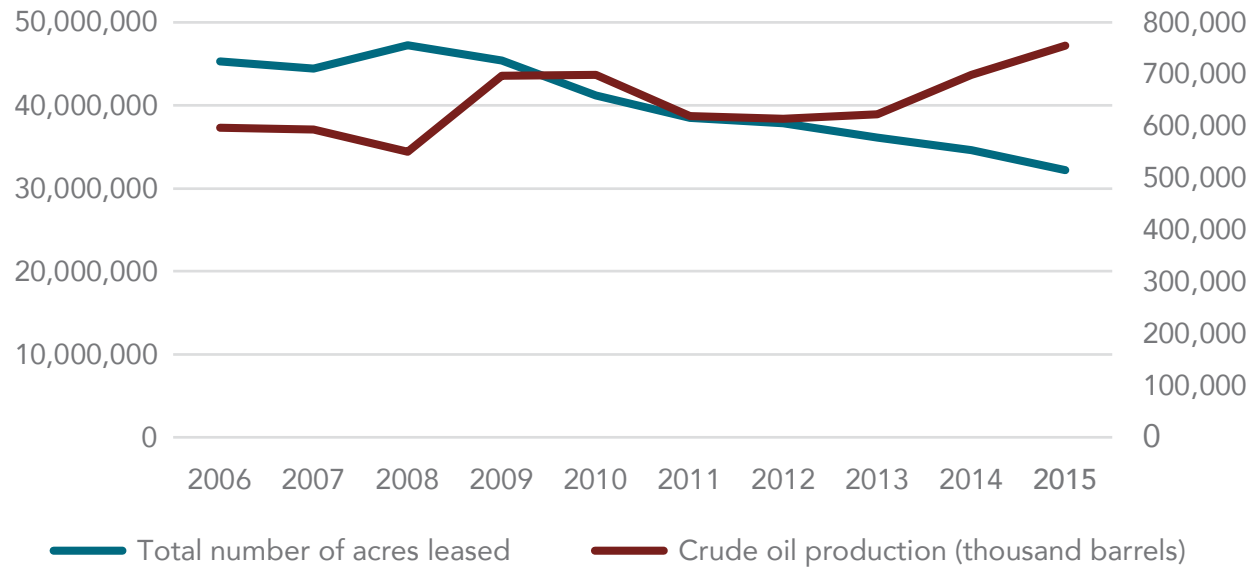
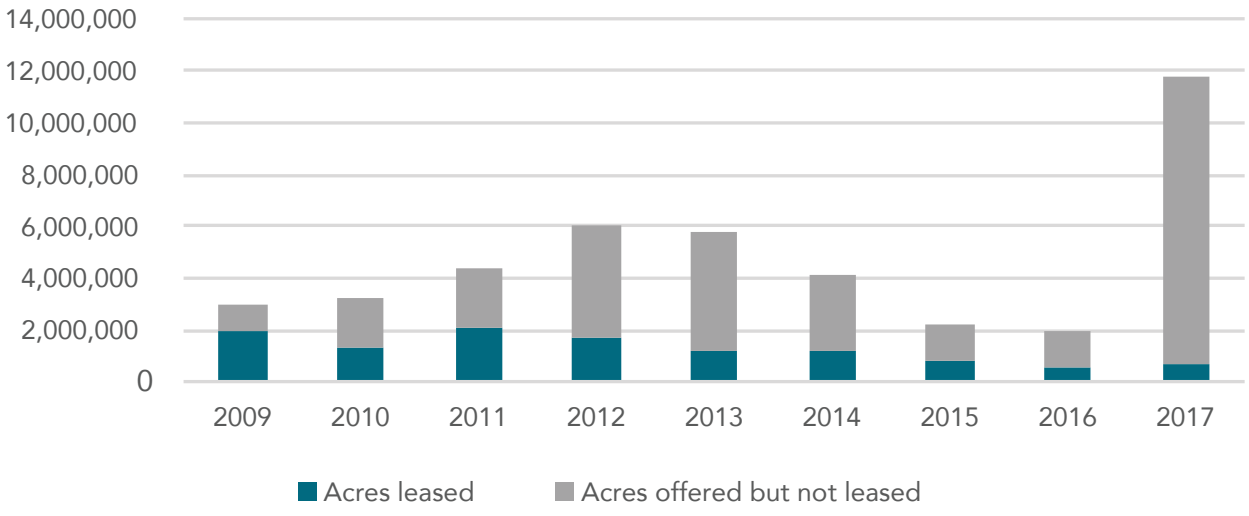


Figure 6. BLM is trying to sell off our public lands but industry isn't buying



Drilling down: a closer look at the U.S. energy market and recent trends

It is important to understand current trends in the domestic and international energy markets to provide context for what development has and will continue to take place on our public lands. Over the past fifteen years, total U.S. production of oil and gas has dramatically increased. From 1990 to 2016, total U.S. natural gas production has increased by 52% while crude oil production is up 21%. Coal production however has continued its slow decline, down 22% since 2006.

A shift from coal to natural gas in the U.S. electricity generation sector has been responsible for much of this change in production levels. In 1990, coal was responsible for over 55% of all electricity generated in the United States while natural gas contributed less than 10%.[16] In 2016, natural gas has nearly achieved parity—coal now makes up only 33% of all electricity generation inputs while natural gas has climbed to over 30%.[17] Crude oil, condensate and other petroleum products continue to dominate the transportation sector and play a significant role, along with natural gas, in meeting the needs of the industrial sector, while electricity and natural gas make up close to 100% of the energy supplied to the residential and commercial sectors.[18]

The nation's reliance on foreign imports of fossil fuels has also declined. The United States continues to import natural gas although total imports, including compressed natural gas (CNG) and liquified natural gas (LNG), have decreased by over 34% since 2007. As domestic production has boomed, exports have skyrocketed, increasing by over 2,000% since 1990. As of 2016 natural gas exports have come close to eclipsing imports.[19] The crude oil and petroleum products trade has followed a similar pattern. Since 2005 imports have decreased by 26% while exports have increased by over 500%.[20] Coal imports and exports however have continued their steady decline. Imports are down over 270% from 2007. While exports have generally held steady since 2000, up around only 3%, they have declined significantly since 2012 by over 53%.[21]

There are a number of factors and market forces that have played a part in the trends we have seen in production, energy use, and international trade.

Domestic production has rallied in recent years. A revolution in petroleum production from shale formations, spurred largely by technological advancements in hydraulic fracturing, led to increased domestic oil production and a surge in associated natural gas production. This in turn drove down natural gas prices leading to its increased use in electricity generation.[22] The surplus of oil and gas introduced into the market also helped to move the United States into a position where exports of both have dramatically increased while imports have fallen, setting the country up to become a net exporter of both in the near term.[23]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Following historically high levels of production and crude oil prices from 2008 to 2014 the market bottomed out. Increased oil production in the United States helped to flood the international market sending crude prices tumbling. In response, the Organization of Petroleum Exporting Countries (OPEC)—a group of 14 nations responsible for almost half of global oil supply—decided to maintain its market share and continue producing at current levels, driving prices down to lows not seen since the early 2000s.[24] By late 2016, OPEC countries agreed to production cuts in an effort to drain global supply and raise prices.[25] This decision by OPEC, along with the subsequent agreement to continue those cuts, has not necessarily achieved its intended results. Prices have rebounded only modestly and U.S. producers have proven to be quite resilient. Their ability to continue to cut production costs and remain profitable in a low-price environment, along with the decision to lift the 40-year moratorium on crude oil exports in 2015, has allowed U.S. producers to take over a larger market share and increase exports.[26,27]

The abundance of natural gas produced as a byproduct of the shale oil revolution brought changes to the natural gas marketplace as well. Increased production along with a growth in international demand have positioned the United States to increase exports.[28] The United States geographic and geopolitical position allows it to work with both the European markets—where there is a demand for reduced reliance on Russian supplies—and the Asian markets—where natural gas is not nearly as plentiful as it is in the U.S.[29] The U.S. Energy Information Administration (EIA) now predicts the United States could become a net exporter of natural gas by the end of 2017.[30]

Unlike the flourishing oil and gas markets, domestic coal production, exports and imports have all declined primarily in response to electricity generators taking advantage of the surplus natural gas and low spot prices to meet demand. International movement away from coal as a fuel source for financial, public health and climate related reasons has also contributed to this decline.

Looking towards the future, EIA's most recent Annual Energy Outlook (AEO) from 2017 predicts that domestically, total energy production (in British Thermal Units (BTUs) including fossil fuel production and electricity production from renewables) will increase by more than 20% from 2016 through 2040, led by increases in renewables, natural gas, and crude oil production. Natural gas production is expected to account for nearly 40% of U.S. energy production by 2040 as it grows at a rate of around 4% per year through 2020. Increased demand from the industrial and electric power markets will drive rising domestic consumption. Crude oil production is predicted to rise but level off around 2025 and production will not reach 2005 levels anytime in the foreseeable future. Despite modest production increases, the United States is projected to become a net energy exporter by 2026. Coal consumption will continue to decrease as it loses market share to natural gas and renewable generation in the electric power sector.[31]

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22. Crooks, Ed "The US Shale Revolution", Financial Times (2015). Available at: https://www.ft.com/content/2ded7416-e930-11e4-a71a-00144feab7de
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29. Gheorghui, Iliua, "Agency Report Projects U.S. Natural Gas Exports Will Quadruple This Year", Morning Consult. (2017). Available at: https://morningconsult.com/2017/07/11/agency-report-projects-u-s-natural-gas-exports-will-quadruple-year/
30. Energy Information Administration, "United States expected to become a net exporter of natural gas this year" (2017). Available at: https://www.eia.gov/todayinenergy/detail.php?id=32412
31. Energy Information Administration, *Annual Energy Outlook 2017*. Available at: https://www.eia.gov/outlooks/aeo/pdf/0383(2017).pdf

On top of the trends highlighted above, shifts in domestic policy can influence energy development on public lands. The Trump administration has clearly prioritized energy development above other uses on public lands and has systematically begun to repeal, rescind, suspend and delay implementation of numerous regulations in an effort to promote American "energy dominance."[32] Considering the position taken by the federal government as well as the larger energy market trends, we should anticipate continued development on our federal lands and we must begin to plan and manage for these outcomes accordingly.

b. Associated carbon and climate consequences

Although federal leasing and production have declined, demand for fossil fuel resources is likely to remain stable or even increase for the foreseeable future. National energy-related greenhouse gas emission projections largely parallel these trends.

The federal mineral program contributes significantly to total U.S. GHG emissions. Each year, approximately 30% of the nation's energy (by thermal content) comes from publicly-owned fossil energy resources leaving a significant carbon footprint. Between 2005 and 2015, the extraction, transportation and combustion of publicly-owned oil, gas and coal accounted for more than 20% of all U.S. GHG emissions and 3-4% of global fossil fuel emissions.[34] According to TWS analysis, in 2015, total GHG emissions from fossil fuels produced on federal lands were 1,439 million metric tons of carbon dioxide equivalent (mmtCO2e), greater than all GHG emissions from Japan.[35] If U.S. public lands were a country, it's emissions would have ranked fifth in the world.

While current emission rates are alarming, potential emissions from future development of both leased and unleased lands pose even more significant concerns. Some studies have estimated that potential GHG emissions from federal and non-federal fossil fuels could be as high as 1,070 gigatons carbon dioxide equivalent (GtCO2e) and public lands alone contain enough recoverable coal, oil and gas that, if developed, could result in as much as 492 GtCO2e.[36] Already leased federal fossil fuels could account for as much as 43 GtCO2e while up to 91% of potential emissions would come from currently unleased reserves.[37] Critically, according to leading scientists, the United States carbon budget—equivalent to 11% of the global carbon budget needed for a 50% chance of limiting warming to 2°C—allocates cumulative emissions of approximately 158 GtCO2 to the United States as of 2011.[38] Continued development of federal fossil fuel resources alone could cause the nation to exceed this threshold.


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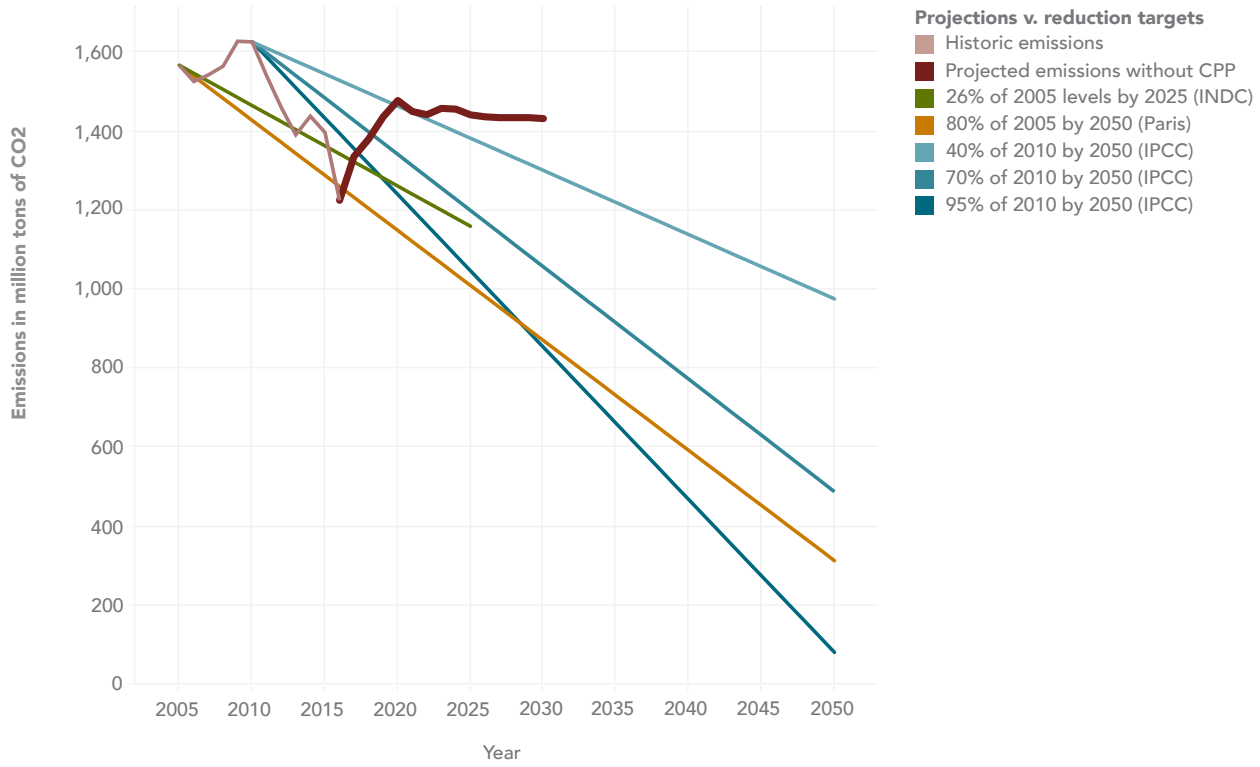
According to a TWS analysis, to compare directly against the U.S.'s economy-wide INDC target of 26-28% reductions by 2025 from a 2005 baseline, lifecycle emissions from federal lands are projected to decline just 13% over that period. Federal emissions need to be reduced from 1.52 billion tons CO2e per year to between 1.16 billion and 1.13 billion tons CO2e per year to be on par with the US's economy-wide INDC reduction target by 2025. Based on current projections federal lands exceed these targets by roughly 300m tons CO2e in 2025 (See Figure 7).

The U.S. government is in the energy business. With over 2.4 billion acres of subsurface minerals, production totals that rank among the highest in the world, and GHG emissions greater than most developed nations, it is indeed one of the largest energy asset managers and must be treated as such.

Figure 7. Projections show that lifecycle emission reductions from federal lands lag behind what is needed to achieve U.S. and IPCC goals



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II. The public demands increased transparency and disclosure of climate information

Despite being one of the largest energy asset managers in the world, the federal government forces its citizen shareholders to make decisions regarding the future of their investments with incomplete information regarding production and leasing as well as associated GHG emissions and potential climate impacts. Were it a publicly traded company, the Securities and Exchange Commission (SEC) would likely find its disclosure practices insufficient. Shareholders and institutional investors now demand that publicly owned companies, particularly those in the fossil fuel industry, take the impacts of climate change into account when making operational decisions. The realization that climate change poses numerous risks to companies, their shareholders and the planet has spurred calls for increased transparency and disclosure. A number of companies have begun to respond by publishing periodic corporate social responsibility statements and including climate related information in their mandatory disclosures.

a. The genesis of disclosure

The genesis of modern corporate disclosure practices lies in the immediate aftermath of the stock market crash of 1929, where over the course of two days in October, the New York Stock Exchange (NYSE) dropped almost 25%. In less than 48 hours, more than $30 billion in shareholder value evaporated.[39] As the Great Depression gripped the nation, President Roosevelt and Congress intervened in an attempt to stabilize the financial markets. Circumventing the so-called "blue sky laws" which governed the previous system at the state level, they passed legislation to end the principal of caveat emptor (buyer beware), replacing it with a disclosure based system that would ensure investors were informed of potential risks prior to making an investment decision.[40]

As part of the New Deal, the administration put in place new securities laws, which led to the creation of the SEC and established a number of disclosure requirements. More specifically, they required publicly traded companies to disclose material information that might affect the company's overall financial condition including an assessment of potential risks to its business model and compensation for management positions.[41] Known as 10-K's, companies are required to submit these forms annually. This system of corporate risk disclosure is still in effect today and has continued to evolve to meet new demands.

Part of that transformation can be attributed to the collapse of Enron. Unprecedented levels of questionable accounting practices and corporate fraud, including efforts to mislead investors about the company's profitability and financial risks, resulted in the 7th largest corporation in the United States declaring bankruptcy and ruining shareholders. In the wake of this collapse, Congress stepped in and established the Public Company Accounting Reform and Investor Protection Act - now universally known as Sarbanes Oxley or SOX. SOX put several new provisions in place, chief among them, the requirement that company leadership (generally the CEO & CFO) personally certify that their 10-K is accurate and complete. Certifying officials can now be held liable under civil and potentially criminal law for any fraudulent reporting.

b. The modern investment community demands climate risk disclosure

While Sarbanes Oxley and other previous regulations and legislation laid the groundwork for companies and their investors to mitigate financial risk, there has been little progress in giving capital markets access to information necessary to evaluate risks due to climate change.

In an effort to shift the paradigm, the Securities and Exchange Commission offered new guidance on how companies should interpret their disclosure requirements as they relate to climate change in 2010.[42] However, a formal rulemaking process has not been initiated and they remain merely suggestions. Due to the voluntary nature of the recommendations, the SEC has few enforcement mechanisms at its disposal. By law, it could force companies to re-write their 10-K reports, but has generally defaulted to issuing letters requesting more information the following year.[43] In 2011, the SEC issued 49 letters to companies addressing their climate disclosures. In 2012, that number dropped to three, and by 2013 it issued none at all.[44] A 2013 study of almost 4,000 publicly traded companies found that only 27% mentioned climate change in their 10-K reports, and almost none mentioned how climate change could physically impact their business.[45]

c. The concern about stranded assets

There are very real financial risks associated with climate change and the failure to disclose those risks to shareholders. By continuing to invest public resources in the federal energy program, the government is betting that demand for fossil fuels will continue to grow without accounting for potential climate impacts. This can lead to the incorrect pricing or valuing of assets and a misallocation of capital.

For decades, the investment community poured trillions of dollars into energy companies around the world under the assumption that demand for fossil fuels would only increase. Yet, scientific consensus around climate change and the impacts of excess carbon emissions, culminating in the Paris Agreement, fundamentally shifted this paradigm. Now, every nation on earth—with the exception of the United States—is committed to holding global temperature rise to under 2 degrees Celsius. Achieving this requires the rapid decarbonization on a global scale. This means transitioning away from the most carbon intensive energy sources like coal and tar sands. As we have described above, this movement is already well under way.

As national governments, subnational jurisdictions and multinational corporations around the world adapt their policies to meet the goals of the Paris Agreement, energy companies will find themselves under greater regulatory constraints as demand for fossil fuels declines.[46] Current estimates from the Carbon Tracker Initiative show that as much as 50% of ExxonMobil's assets fall outside the global carbon budget and as much as 40% of Chevron's assets could be similarly positioned. Such realities expose shareholders of such companies to enormous financial risk. A 2008 study by McKinsey and the Carbon Trust showed that "more than half of the share value of oil and gas companies results from future cash flows generated after more than 10 years."[47] The potential inability for these companies to access these resources tomorrow means their stocks could be potentially overvalued today. Such a scenario is not without precedent. In 2004, when Royal Dutch Shell announced a 20% downward adjustment of its estimated reserves, the company's stock price fell 10% in less than a week, reducing the company's value by almost $3 billion.[48]

Yet the problem of stranded energy assets extends far beyond the boardrooms of energy companies. Increasingly, insurers are speaking out, rethinking their long-term business models in an effort to avoid potentially catastrophic write downs to their portfolios in the coming years.[49] The industry finds itself uniquely exposed, as both a major investor, with more than $30 trillion in invested capital across the global economy, and as a financial guarantor that could be compelled to pay enormous sums of money in claims as a result of loss from climate change.[50] Governments with large fossil fuel reserves could see similar fiscal challenges as falling revenues could potentially devalue any sovereign bonds that have been issued.[51]

Energy companies must take note of these trends. Many, if not most of their current assets could become stranded and securing financing for new fossil fuel projects will be more difficult. They must begin to make informed decisions on how best to deliver cost effective energy to their customers and profits to their shareholders. Transparency and disclosure of these potential risks represent the necessary first step in addressing the problem.

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d. Best practices of climate disclosure

With few mandatory climate disclosure requirements, investors are stepping in to fill the void. An international task force, chaired by former New York City Mayor Michael Bloomberg, was created in 2015 to examined how the financial markets could embrace internationally adopted best practices of financial disclosure.[52] The Task Force on Climate-related Financial Disclosures (TCFD) released its recommendations in June of 2017. The task force structured its recommendations for more standardized disclosure reporting around four categories:

1) Governance

Shareholders must charge boards of directors, as well as corporate executive leadership, with deploying the vision necessary to ensure the company succeeds moving forward, ultimately holding leadership accountable for product quality, profitability, and other similar metrics. The task force recommended that investors judge a company on its ability to identify and mitigate the business risks associated with climate change and capitalize on the business opportunities that a low-carbon economy can bring. A corporate governance structure blind to such issues can be as dangerous to the long-term viability of a company as any other risk disclosed under Sarbanes Oxley.

2) Strategy

Having the right people and management procedures in place does little good if those people are not willing or able to conceive of and implement the strategic vision to insulate the company from the possible effects of climate change. As identified above, direct and transactional climate risks can pose an existential risk, one that could jeopardize the future of the business. To best ensure that investors and capital markets are fully informed, the task force recommended that publicly traded companies disclose the short, medium and long-term risks and opportunities related to climate under different, plausible climate scenarios.

3) Risk management

Identifying the risks and opportunities driven by a changing climate without an actionable plan to address them in the positive or the negative can cause more vulnerabilities than it prevents. Successful companies worthy of capital investment have robust risk management procedures to protect their shareholders from unexpected market shocks, or other similar catastrophic events. While no company can perfectly predict the future, it can and should identify the potential threats to the business model. The task force recommended that each company disclose the processes by which it identifies climate risk, as well as the procedures it will employ to address these risks in a fiscally responsible manner.

4) Metrics and targets

A risk to one company might not be classified in the same way by another. Therefore, companies should disclose the metrics and targets used to identify each risk. Further, all companies should disclose their emissions and how those emissions contribute to the issues identified in the first three categories.

Financial histories and projections play a key role in this analysis. However, climate change continues to insert a level of unpredictability into future projects, and makes it increasingly important for investors to analyze the governance structures and risk management procedures of a given company. While it is unlikely that the current administration will support the expansion of Sarbanes Oxley to cover climate related risks, the task force has encouraged forward thinking companies to voluntarily disclose the challenges they and their investors will face in a rapidly changing climate. Without the right information, investors may incorrectly price or value assets, leading to a misallocation of capital. Such disclosures should not be viewed as an impediment to investment, but rather a catalyst for it. Capital flows towards markets where risk is lowest, and profit has the potential to be both sustainable and dependable. Identifying climate risks can help companies visualize those opportunities. The recommendations put forth by the task force should be embraced by all energy asset managers including the federal government. Increased transparency and risk disclosure is essential to proper management of the federal mineral estate.

52. "Final Report: Recommendations of the Task Force on Climate Related Financial Disclosures" *Task Force on Climate-related Financial Disclosures*, 15, Jun. 2017 https://www.fsb-tcfd.org/wp-content/uploads/2017/06/FINAL-TCFD-Report-062817.pdf

III. The federal energy program lacks transparency and data availability leading to inadequate disclosure of potential risks

The federal government, like many energy companies, has failed to adequately inform its shareholders about the extent of the energy assets it manages and the potential climate risks associated with its energy program. Although a number of agencies and departments collect data related to federal coal, oil and gas development, they often fail to track the most relevant metrics and much of what they do record is inaccessible to the public. Here we have attempted to identify what information is available, its usability and any remaining gaps.

a. Oil, gas and coal data availability and shortcomings

Data related to federal oil, coal and natural gas is published by several different sources including the EIA, BLM, USFS, U.S. Geologic Society (USGS), Office of Natural Resources Revenue (ONRR), Miner Safety and Health Administration (MSHA), the Environmental Protection Agency (EPA) and U.S. Extractive Industries Transparency Initiative (USEITI) operated by DOI. Each agency publishes information that is useful in understanding the scale of the federal energy program and its potential risks. A detailed summary of available data can be found in Appendix A.

The current system of data tracking and dissemination suffers from a number of obvious flaws. First and foremost, there is no centralized publicly accessible database. This means that interested parties must search for information across several data sources and conduct their own analyses. Additionally, much of the available data is incomplete. Some data sets only go back several years while others have not been updated recently or have been discontinued. Most importantly, the federal government has failed to make additional necessary and reliable information available. For example:

- EIA data is not broken out by mineral ownership either in historic data sets or in the energy outlooks. There is also a substantial amount of relevant data that EIA has either stopped tracking or does not report due to its proprietary nature including the number of active wells and well drilling activity.
- BLM does not publish the number of active and new wells or the volume of oil, gas or condensate produced from those wells, identifying key data as "confidential business information" (CBI). It also restricts the public's access to documents like applications for permit to drill (APDs) and sundry notices. The agency's Legacy Rehost System is notoriously difficult to use and the most complete oil and gas databases maintained by BLM (Automated Fluid Minerals Support System and Well Information System) are reserved for agency staff and operators only.
- The ONRR records production and royalty data for federal onshore and offshore oil and gas and coal but makes only a limited amount of that data publicly available.
- The MSHA Mine Data Retrieval System allows users to search only one mine at a time and does not specify land ownership status.

To make matters worse, the current administration has begun to withhold oil and gas leasing and production data previously made available to the public.[53]

Perhaps the most accessible federal energy resource database is maintained by the Department of the Interior under the USEITI. EITI is a global standard that promotes open and accountable management of natural resources and relies on a number of informal partnerships and reporting between various government agencies and private enterprises. The United States committed to joining this initiative in 2011 and was accepted in 2014. Then Secretary of the Interior Sally Jewell praised the decision, stating in a press release that "it underscores…[the United States'] continued and unwavering commitment to leading by example in promoting transparency, accountability, and good governance both domestically and globally."[54] The initiative commits countries to full transparency of extractives revenues from federal lands, such as from extraction of its offshore oil and to "working together with business and civil society organizations to ensure an informed debate about how its natural resources are

being managed."[55] To further the goals of the initiative, DOI developed a website that includes important information regarding energy production on our federal lands. USEITI publishes data for federal and non-federal oil, gas, LNG and coal resources. It includes production volumes, non-tax revenue derived from federal production and federal disbursements of revenue showing where the money generated from non-tax revenue on federal lands goes. Unfortunately, the Trump White House announced on November 2nd that the U.S. is formally withdrawing from the EITI though the U.S. will continue to "comply with spirit of agreement."[56] The fate of the USEITI information stream is unclear.

b. Emissions data

Production and market data like that described above are important for understanding the magnitude of federal energy development and can be used to help make informed decisions on public lands moving forward. But it is only a piece of the puzzle. Even more important to the larger argument made here—that asset managers must disclose to their shareholders relevant information regarding potential climate risks and that the government must consider climate impacts when making future federal energy decisions—is data related to GHG emissions.

Unlike production data, there are very few official sources of historic and projected GHG emissions and no comprehensive accounting of emissions from federal lands. In fact, the only agency disclosing any emissions information is the EPA, and it is being done in a limited capacity. Along with a number of other responsibilities, the EPA is charged with monitoring emissions in the United States. Historically, this meant tracking and reporting criteria pollutant emissions like NOx, ozone and particulate matter, but the threat of climate change and domestic as well as international commitments to address it have expanded the scope of EPA's work.

The EPA has prepared the Inventory of U.S. Greenhouse Gas Emissions and Sinks (GHGI) every year since the early 1990s. This annual report provides a comprehensive accounting of total greenhouse gas emissions for all man-made sources in the United States.[57] The GHGI helps to inform policy and industry decision making by tracking GHG emission trends and quantifying the U.S. contribution to climate change. An important component of the inventory work is EPA's Greenhouse Gas Reporting Program (GHGRP). The GHGRP requires mandatory reporting of greenhouse gases from the largest greenhouse gas emissions sources in the United States (sources that emit 25,000 metric tons or more of carbon dioxide equivalent per year in the United States). The GHGRP is an estimate of emissions at the facility level that have already been released into the atmosphere; it does not predict future emissions. The GHGRP dataset is complementary to and an important component of the GHGI.

However, EPA's reporting program is not mandatory and the emissions inventory lacks details for federal lands. In general, federal fossil fuel data provided by the various government agencies is lacking both in functionality and availability. While it is possible to piece together a picture of the federal energy landscape, it is an exercise that requires an immense amount of time and background knowledge. In other words, it would not meet the standards for disclosure that we would expect from a publicly traded company.

53. Natural Resources Committee Democrats, "Press Release: Countering Administration Silence, Lowenthal-Grijalva Bill Mandates Disclosure on Industry Hoarding of Unused Permits to Drill." *U.S. House of Representatives*, 24, October 2017. Available at: https://democrats-naturalresources.house.gov/media/press-releases/countering-administration-silence-lowenthal-grijalva-bill-mandates-disclosure-on-industry-hoarding-of-unused-permits-to-drill
54. Extractive Industries Transparency Initiative, "Media release: United States accepted as member of resource transparency body." (2014). Available at: https://eiti.org/news/media-release-united-states-accepted-as-member-of-resource-transparency-body
55. Ibid
56. Gould, Gregory J. "Letter to Mr. Fredrik Reinfeldt, Chair Extractive Industries Transparency Initiative" 2 Nov. 2017. Available at: https://www.doi.gov/sites/doi.gov/files/uploads/eiti_withdraw.pdf
57. Under the United Nations Framework Convention on Climate Change (UNFCCC), the United States is obligated to develop nationally representative GHG emission estimates from anthropogenic sources on an annual basis.

c. Planning for energy development on public lands

Our oil, gas and coal resources are supposed to be managed by the federal government for the public interest. For too long, the public has lacked any information about actual or expected carbon emissions and climate impacts that may result from leasing and development decisions. These lands are part of the way we approach climate change as a nation, but today are barely part of the conversation. Disclosure of potential emissions and climate impacts associated with the federal energy program is limited to brief and often inadequate analyses included in environmental impact statements (EIS) and environmental assessments (EA) prepared under the National Environmental Policy Act (NEPA) for land use planning processes, lease sales and permitting decisions. The BLM, USFS and BOEM all conduct similar environmental analyses when approving the development of public energy resources. They utilize much of the data described above to inform their decisions. However, in most instances the information disclosed by the agency in the decision document is incomplete, the analysis of potential emissions and climate impacts is inadequate, and the facts fail to support the final decision to allow development.

i. Land use planning (RMPs and LRMPs)

The BLM develops a resource management plan (RMP) for each field office that will guide and at times dictate surface uses of the lands under its purview. More specifically, an RMP is a set of comprehensive long-range decisions concerning the use and management of resources administered by the BLM. It provides an overview of goals, objectives, and needs associated with public lands management and attempts to resolve existing or potential multiple-use conflicts. A large component of any RMP where energy resources are known to exist is addressing where, when and how those resources can be developed. In an effort to make such determinations, the BLM will prepare a reasonable foreseeable development (RFD) scenario as well as an environmental impact statement (EIS). Together those documents provide the basis for decisions regarding future energy development on public lands. The USFS, in preparing its land and resource management plan (LRMP), conducts similar analyses and often relies on the BLM in making its final determinations. BOEM, on the other hand, prepares a 5-year program that establishes a schedule of oil and gas lease sales for each planning area on the U.S. Outer Continental Shelf. The Program specifies the size, timing, and location of potential leasing activity that the Secretary of the Interior determines will best meet national energy needs. For simplicity's sake we will focus on the BLM process. Note however, that the USFS and BOEM processes are largely similar both in terms of the information they provide and the inadequacy of their analyses.

Prior to conducting any environmental analysis, the BLM will prepare an RFD. The RFD includes relevant geologic, economic and other technical information regarding oil and gas development in the region. It typically identifies "the number, density and type of wells likely to be drilled within these areas… and the estimated cumulative production by type of product (e.g., oil, gas, geothermal or by-products)."[58] It includes both historic trends and projections extending out for the life of the plan (typically 15 years). Based on the information in the RFD the BLM then assesses direct, indirect or "related effects on natural systems…" as well as the cumulative or "incremental impact of the action when added to other past, present, and reasonably foreseeable future actions…" in the EIS.[59] These impacts must be considered in weighing alternatives against one another and in making final determinations regarding what lands are allocated as open, closed or open with restrictions to oil and gas leasing.

In almost every instance, both the RFD and subsequent EIS fail to adequately quantify potential GHG emissions and climate change plays little if any role in comparing alternatives or assessing direct, indirect or cumulative impacts from development in the planning area. As a result, 90% of BLM-managed subsurface mineral acres are open to leasing in current RMPs across the West.

Often the agency punts the quantification of potential emissions down the road to the leasing or permitting stage. The agency argues that there are too many unknown variables at the planning stage and that any attempt to project emissions would be speculative. However, this is simply not true. A range of potential emissions would be sufficient and could be developed and disclosed in the NEPA process.

ii. Lease sales and permitting

When conducting a lease sale or reviewing an APD, the BLM will frequently prepare an EA or EIS pursuant to NEPA.[60] The requirements for this analysis are largely similar to those for the EIS prepared alongside an RMP amendment. Therefore, BLM is required to consider the climate impacts of any leasing decision. Despite more detailed information regarding future development even at the leasing stage, the agency often argues that projecting potential emissions is unnecessary and again, speculative. At the permitting stage the agency has been provided specific information regarding well type, target formation, estimated production and other important metrics. With this information, the BLM can easily quantify potential emissions associated with a particular well. Unfortunately, an analysis of GHG emissions either at this stage often results in the agency concluding the resulting emissions are insignificant when compared to national or global emissions.

While the land use planning, leasing and permitting processes can yield useful information about energy development on federal lands, the way in which GHG emissions are analyzed and factored into decisions renders the exercise essentially useless for the purpose of climate change analysis and decision-making. The environmental review process has the potential to help meet transparency and disclosure goals. Theoretically, it should work to distill detailed data into understandable outcomes for the public. However, the current process has proven to be of limited use. In order to manage production of federal fossil fuel resources in a way that allows the nation to work towards mitigating the impacts of climate change, federal agencies must consider potential emissions associated with land use and leasing decisions and use these planning processes to provide additional information to the public.

58. BLM Handbook H-1624-1(III)(B)(4)(a)(1)
59. Id at (III)(B)(5)
60. BLM sometimes uses Determinations of NEPA Adequacy (DNAs) for lease sales and frequently uses categorical exclusions for APDs, both of which involve no NEPA analysis. Approving actions under a DNA or categorical exclusion means there is no additional analysis of climate change impacts of potential GHG emissions.

IV. The federal government should be disclosing carbon risk to its shareholders, the American people

Despite numerous agencies tracking energy related information and planning and environmental review processes that require public participation, the government has failed to adequately inform the public about the federal energy program and the potential climate risks associated with it. Disclosing the risks associated with climate change and the continued development of federal energy resources is in the public's interest. As with any publicly traded company, shareholders, or in this case US citizens, cannot provide informed recommendations on long-term decisions (such as RMPs) or more immediate actions (such as lease sales and APD approvals) without access to necessary data. The government, and more specifically DOI, must follow the lead of the private sector and implement climate risk disclosure practices and begin to manage federal lands in accordance with those risks.

a. Climate science confirms that energy development should be constrained by allowable carbon emissions

First, and foremost, there is now a well-established scientific understanding that the global increase in temperature due to greenhouse gas emissions must be limited at or below 2 °C, to avoid unmanageable climate change consequences. This "carbon budget" concept was enshrined in the Copenhagen Accord in 2009 and was reaffirmed and strengthened in the Paris Agreement, which established a commitment to make efforts to limit temperature rise to 1.5 °C.[61,62]

In 2012, the International Energy Agency concluded there is a limit to the amount of fossil fuels that can be developed if the world is to remain within even the 2 °C ceiling. Based on an assessment of global carbon reserves, and given existing pollution controls, the agency concluded that "[n]o more than one-third of proven reserves of fossil fuels can be consumed prior to 2050 if the world is to achieve the 2 °C goal."[63]

In late 2014, this analysis was expanded and strengthened by the Intergovernmental Panel on Climate Change (IPCC). The Climate Change 2014 Synthesis Report calculated that emissions would need to be limited to about 2,900 GtCO2 since 1870 to have a reasonable chance of staying under the ceiling.[64,65] By 2011, about 1,900 GtCO2 had already been emitted.[66] Thus, the report concludes, to provide better than a 66% chance of limiting warming to less than 2 °C, additional carbon dioxide emissions must be limited to 1,000 GtCO2.[67] It also estimated that there are about 3,670 to 7,100 GtCO2 in proven fossil fuel "reserves" remaining in the ground.[68] This volume is four to seven times the amount that can be burned to have better than a 66% chance of remaining within the 2 °C warming goal.[69]

In early 2015, the IPCC's work was refined further when the scientific journal Nature published a study that identified which fossil fuels must remain undeveloped to improve the chances of remaining below the warming cap.[70] It quantifies the regional distribution of fossil fuel

61. Copenhagen Accord ¶ 1, agreed Dec. 18, 2009, FCCC/CP/2009/11/Add.1, http://unfccc.int/resource/docs/2009/cop15/eng/11a01.pdf ("recognizing the scientific view that the increase in global temperature should be below 2 degrees Celsius" relative to pre-industrial temperatures to "stabilize greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system"); id. at ¶ 2 (agreeing that "deep cuts in global emissions are required according to science" to meet this goal).
62. Paris Agreement, at art. 2, ¶ 1(a).
63. *Id.* at 25.
64. Intergovernmental Panel on Climate Change, Climate Change 2014: Synthesis Report (2014), http://www.ipcc.ch/report/ar5/syr/.
65. *Id*
66. *Id*
67. *Id*
68. *Id.* at 64, Tbl. 2.2; id., Tbl. 2.2 n.f (defining "reserves" and noting that "resources," by contrast, are quantities of fossil fuels where economic extraction is potentially feasible).
69. *Id* at 63.
70. C. McGlade & P. Ekins, *The Geographical Distribution of Fossil Fuels Unused When Limiting Global Warming to 2 °C*, 517 Nature 187, 187 (2015).

reserves and resources and, through modeling a range of scenarios based on least-cost climate policies, identifies which reserves and resources will not be burned between 2010 and 2050 if the world efficiently complies with the 2 °C limit.[71]

On June 28, 2017, the U.S. Global Change Research Program—comprised of the nation's top climate scientists—completed a final draft report "designed to be an authoritative assessment of the science of climate change, with a focus on the United States, to serve as the foundation for efforts to assess climate-related risks and inform decision-making about responses."[72] The report concludes that significantly expanded fossil fuel development would seriously hinder our ability to avoid the worst effects of climate change and that if we are to avoid the worst effects of climate change, nations must drastically and rapidly limit the amount of carbon they emit into the atmosphere. It confirms that there is a limit to the amount of carbon that can be emitted—"CO2 emissions are required to stay below about 800 GtC in order to provide a two-thirds likelihood of preventing 3.6 [degrees Fahrenheit (2 degrees Celsius)] of warming."[73] And it tells us how much more can be emitted until that limit is reached—"approximately 230 GtC more could be emitted globally."[74] Thus, "[s]tabilizing global mean temperature below 3.6 [degrees Fahrenheit (2 degrees Celsius)] or lower relative to preindustrial levels requires significant reductions in net global CO2 emissions relative to present-day values before 2040 and likely requires net emissions to become zero or possibly negative later in the century."[75]

b. Federal agencies should be disclosing carbon emissions and climate risks under current law

Although the government has not done an adequate job of disclosing climate risk and making information available to the public, federal agencies are nonetheless legally required to take the impacts of climate change into consideration when making decisions. At the planning, leasing and permitting stage, courts have repeatedly held that NEPA requires agencies to consider climate change when analyzing decisions.[76]

It is now well established that when an agency considers a decision that has the potential to affect greenhouse gas emissions, NEPA requires it to analyze and disclose the effects of these emissions as indirect or cumulative effects.[77] Most recently, the District of Montana held that an agency must quantify the costs of greenhouse gas emissions from a fossil-fuels-extraction project if it quantifies the benefits in a NEPA document.[78] And the D.C. Circuit has now held that agencies must analyze the climate effects of burning fossil fuels conveyed by pipeline projects they approve.[79]

Most importantly, reliable methods and tools exist to measure and disclose the amount of greenhouse gas emissions from federal coal, oil and gas. As part of its analysis of climate change, BLM should use available tools to determine the costs of greenhouse gas emissions. One such tool has been developed by the Interagency Working Group on Social Cost of Carbon.[80] The Social

71. See id. at 187-90.
72. U.S. Global Change Research Program, Climate Science Special Report (CSSR), Fifth-Order Draft (5OD) at 1 (June 28, 2017).
73. *Id.* at 34.
74. *Id.*
75. *Id.* at 34.
76. See, for example, *Center for Biological Diversity v. NHTSA*, where the Ninth Circuit assessed an agency's NEPA analysis for a rule requiring automobile manufacturers to increase the fuel efficiency of their vehicles, thereby lowering average tailpipe emissions per mile driven. The Court stated that "[t]he impact of greenhouse gas emissions on climate change is precisely the kind of cumulative impacts analysis that NEPA requires agencies to conduct." Ctr. for Biological Diversity, 538 F.3d at 1217. 1223-25 (9th Cir. 2008).
77. See *Center for Biological Diversity v. NHTSA* (538 F.3d at 1217, 1223-25.); see also *Mid States Coalition for Progress v. Surface Transportation Board* (345 F.3d 520, 549-50 (8th Cir. 2003)); see also *High Country Conservation Advocates v. U.S. Forest Serv., (52 F. Supp. 3d 1174, 1197-98 (D. Colo. 2014)*); See also *Dine Citizens Against Ruining our Env't v. Office of Surface Mining Reclamation and Enforcement [OSMRE], 82 F. Supp. 3d 1201* (D. Colo. 2015).; see also *Wild Earth Guardians v. OSMRE*, 104 F. Supp. 3d 1208 (D. Colo. 2015). and *Wild Earth Guardians v. OSMRE, No. CV 14-103-BLG-SPW (D. Mt., Oct. 32, 2015, Jan 21, 2016).*
78. *Mont. Envtl. Info. Ctr. v. U.S. Office of Surface Mining*, No. CV 15–106–M–DWM, 2017 WL 3480262, at *12–15 (D. Mont. Aug. 14, 2017); see also id. at *13 (noting that the agency had quantified royalties and tax revenues from mining). In 2013, BLM estimated that oil and gas exploration and development in the NPRA would generate some $34 billion in governmental revenues over 30 years under the preferred alternative. IAP/EIS Vol. 3, at 113-14 & Tbl. 4-27.
79. *Sierra Club v. Fed. Energy Regulatory Comm'n*, No. 16–1329, 2017 WL 3597014, at *1 (D.C. Cir. Aug. 22, 2017).
80. Environmental Protection Agency, EPA Fact Sheet, *Social Cost of Carbon*.

Cost of Carbon (SCC) is a leading tool for quantifying the climate impacts of proposed federal actions. The SCC is an estimate, in dollars, of the long-term damage caused by a one ton increase in CO2 emissions in a given year; or viewed another way, the benefits of reducing CO2 emissions by that amount in a given year. It is intended to be a comprehensive estimate of climate change damages that includes, among other costs, the changes in net agricultural productivity, risks to human health, and property damages from increased flood risks. The method was initially designed for application in rulemakings, but the courts have recognized its applicability to NEPA analyses.[81] The working group presented values for social costs from 2015 to 2050 that range from $11 to $212 (in 2007 dollars per metric ton of carbon dioxide)[82] and could be used to monetize the costs imposed by the net greenhouse gas emissions that might eventually result from leasing. In addition, the EPA has developed a companion protocol called the Social Cost of Methane method, focusing on methane emissions. The 2010 SCM has been estimated to be between $370 and $2,400 per ton of methane in 2007 dollars.[83] The significantly higher social cost estimates for an additional ton of CH4 relative to CO2 is due to the significantly larger radiative forcing generated by this gas which has a global warming potential of between 28 and 86 times that of carbon dioxide. Together, these methods provide a way to quantify the costs of GHG emissions and present them to the public.

Recently, the Trump Administration proposed a revised method for calculating SCC and SCM. The new interim methodology relies on the flawed premise the scientifically accepted methodology previously developed overestimated the benefits of reducing GHG emissions. The revised methodology recommends that future damages be discounted using constant discount rates of 3 and 7%. This is a departure from the previous methodology which estimated SCC at a 2.5, 3 and the 5% discount rates. A higher discount rate leads to a lower SCC and a lower SCC suggests a lower value placed on preventing future damages. A 7% discount rate is far higher than 5% ceiling used previously and distorts the benefits associated with GHG reductions.

The revised methodology further undermines the benefits of GHG emission reductions by suggesting federal agencies consider only national, rather than global impacts associated with climate change, in addition to using higher discount rates. Under Scott Pruitt, the EPA now recommends taking 10% of the global approximation of climate change impacts and attributing them to the United States. There are several issues associated with using a domestic rather than global estimate of climate impacts. First, the majority of damages from US-borne CO2 emissions accrue to non-US citizens, while the majority of damages borne by the United States come from emissions abroad, and it's imperative that a carbon accounting initiative incorporates the full extent of realized damages.[84] Additionally, a domestic value may fail to account for indirect impacts. As stated in a recent report by the National Academies of Sciences, "It is important to consider what constitutes a domestic impact in the case of a global pollutant that could have international implications that impact the United States."[85] For example, if the United States adopts a domestic social cost of carbon estimate for policymaking purposes, and that choice leads to greater global CO2 emissions, the United States could be impacted beyond what the initial domestic analysis accounted for.[84] Finally, climate change is a global problem and will only be solved through coordination and international cooperation; domestic leadership is necessary for successful negotiations with other countries. A domestic SCC value does little good when attempting to rectify this international issue.

Since the benefits of fossil fuel production are regularly monetized in BLM's NEPA documents, it is critical that the impacts also be monetized. Federal agencies should use these values to quantify the costs of consuming the oil and gas that could be produced from any new leases. Such an exercise would significantly improve current agency analysis of climate impacts and assist the agencies in meeting their legal requirements.

81. See High Country Conservation Advocates v. U.S. Forest Serv., 52 F. Supp. 3d 1174 (D. Colo. 2014).
82. Interagency Working Group on Social Cost of Carbon, United States Government, Technical Support Document: - Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866 at 2 (Aug. 2016 revision). Although President Trump directed the Office of Information and Regulatory Affairs to withdraw this metric, it remains the best available tool for complying with the legal requirement to analyze the effects of greenhouse gas emissions. See Exec. Order No. 13,783, 82 Fed. Reg. 16,093, 16.095–96 (Mar. 28, 2017) at 2-3.
83. Interagency Working Group on Social Cost of Greenhouse Gases, United States Government. 2016. Addendum to Technical Support Document on Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866: Application of the Methodology to Estimate the Social Cost of Methane and the Social Cost of Nitrous Oxide. Available at: https://archive.epa.gov/epa/sites/production/files/2016-12/documents/addendum_to_sc-ghg_tsd_august_2016.pdf.
84. Wichman, C.J. (2017). The Strategic Costs of Carbon Emissions: Global versus Domestic Policy Considerations. Retrieved from http://www.rff.org/research/publications/strategic-costs-carbon-emissions-global-versus-domestic-policy-considerations.
85. National Academies of Sciences, Engineering, and Medicine. 2017. Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide. Washington, DC: The National Academies Press. doi: https://doi.org/ 10.17226/24651.

V. Conclusion

Any effort to seriously address U.S. GHG emissions and adhere to our domestic and international climate commitments necessitates a shift in the way we manage energy resources on our public lands. They account for a substantial portion of total U.S. energy production and GHG emissions. Moreover, the federal government, and more specifically DOI, have broad discretion and authority over the management of our public lands. The government is required to disclose the climate impacts of its energy program and to seek public input when making land use decisions. Addressing energy development on our public lands is the ideal place to start if we are going to meet the ambitious goals outlined above.

To date, the government has failed to effectively manage our public lands as part of the climate solution. The current planning, leasing and permitting processes all fail to adequately analyze potential emissions from federal energy development and the associated climate impacts. Additionally, the agencies responsible for tracking and disseminating information regarding federal energy production have fallen short in their efforts to collect the necessary data and provide it to the public in an accessible and transparent manner.

These failures have put the American public at risk both financially and physically. By investing public resources in the federal energy program, the government is banking on the continued demand for fossil fuels. Like a private energy corporation, this could lead to the incorrect pricing or valuing of assets and a misallocation of capital. In this case, capital refers to the time, energy and expenditures associated with planning, leasing, permitting as well as the general operation of the federal energy program. Capital flows towards markets where risk is lowest and profit has the potential to be both sustainable and dependable. The threat of climate change has altered those markets. Capital once invested in the federal energy program may now yield better returns if invested in other areas. That includes supporting other uses of our federal lands, whether for recreation or renewable energy development. Unlike a private corporation however, the wrong decision impacts each and every American. Furthermore, continuing to produce fossil fuels from our federal lands at current levels will only exacerbate the impacts from climate change we have already begun to see in the United States which includes increased risk of flooding and forest fire, more intense and extended droughts, and an increase in the frequency and intensity of severe storms. This endangers property, livelihoods and lives.

The Wilderness Society will continue to advocate for the federal energy program to operate in line with the need to cut GHG emissions. Since the government has been unwilling to take the necessary steps to begin disclosing climate impacts and managing our federal lands accordingly we will do it for them. This information is a starting point for ensuring the public's energy assets are truly managed in the public interest.

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Appendix

	Oil & Gas	Coal	GHG Emissions	Revenue
Energy Information Administration (EIA)	• Historic oil and gas data including production, price, imports, exports, consumption, reserves and sales, etc… • Projections of price, production, supply and demand. Includes short-term energy outlooks (monthly) and long-term forecasts (Annual Energy Outlook).	• Historic coal data including production, price, imports, exports, consumption, reserves and sales, etc… Interactive Coal Data Browser interface currently being built out. • Short-term energy outlooks published monthly, AEO published annually.	• No regular updates provided. Most recent report released in 2011. Report series has been discontinued.	None
Bureau of Land Management (BLM)	• Oil and gas lease information including the number of active leases, the acreage in effect, the number of producing leases and the number of new leases issued updated annually. • Maintains a web based portal (ePlanning) that allows the public to track and review NEPA documentation for oil and gas projects on BLM lands as well as land use plan decisions. • The Legacy Rehost System (LR2000) is a searchable database for public reports on BLM land and mineral use authorizations, conveyances, mining claims, withdrawals and classifications.	• Coal lease data from each successful lease sale since 1990 including, applicant, number of acres, estimated recoverable tons and the price the lease was sold for both as a price per ton and price per acre is updated annually and posted online. • More specific coal lease data is available via LR2000.	Not actively monitored or recorded. NEPA documents associated with land use plans, lease sales or permit approvals may include estimated of potential emissions.	Coal and oil and gas lease sale results include the sale price of each parcel. No royalty or rental revenue publicly available.

	Oil & Gas	Coal	GHG Emissions	Revenue
Bureau of Land Management (BLM)	• The National Fluid Lease Sale System, is a third-party system used to conduct lease sales online and provides real-time access to sales. • The Automated Fluid Minerals Support System (AFMSS2) and the Well Information System (WIS) are internal databases used by operators and the BLM to track oil and gas data, neither are publicly accessible.			
U.S. Forest Service (USFS)	Relies largely on BLM data and analysis. Forest plans may include a summary of energy potential and future management decisions.	Relies largely on BLM data and analysis. Forest plans may include a summary of energy potential and future management decisions.	NEPA documents may estimate potential GHG emissions from future development.	None
Bureau of Ocean Energy Management (BOEM)	• Combined Leasing Reports released monthly include data on acres leased, number of leases and number of producing leases in each offshore region. • Resource Assessment Program identifies potential future plays on the OCS. • Reserves Inventory Program estimated remaining recoverable volumes in existing plays	N/A	5-year plans evaluate potential emissions from offshore leasing decisions.	None

	Oil & Gas	Coal	GHG Emissions	Revenue
U.S. Geological Survey (USGS)	Periodically updates its National Oil and Gas Assessment. Provides assessments of the oil and natural gas endowment of the United States, including assessments of potential in both conventional and unconventional plays as well as estimated technically recoverable volumes.	• "Coal Assessments" similar to those completed for oil and gas resources track recoverable coal and estimated reserves. • National Coal Resource Data System characterizes the location, quantity, and physical attributes and chemistry of U.S. coal and coal-related deposits.	The agency often collaborates in studies of national GHG emissions but does not maintain a publicly accessible or searchable database.	None
Office of Natural Resources Revenue (ONRR)	Tracks and maintains a database that includes total production, royalties collected and disbursements paid.	Tracks and maintains a database that includes total production, royalties collected and disbursements paid.	None	Tracks and maintains a database that includes total royalties collected and disbursements paid.
Mine Safety and Health Administration (MSHA)	N/A	Mine Data Retrieval System provides data on specific mines including production totals. Limited to searching one mine at a time.	None	None

	Oil & Gas	Coal	GHG Emissions	Revenue
Environmental Protection Agency (EPA)	None	None	• U.S. Greenhouse Gas Emissions and Sinks (GHGI) annual report provides a comprehensive accounting of total greenhouse gas emissions for all man-made sources in the United States. Tracks GHG emission trends and quantifies the U.S. contribution to climate change. • Greenhouse Gas Reporting Program (GHGRP) the largest greenhouse gas emissions sources in the United States to report emissions annually. Provides an estimate of emissions at the facility level that have already been released into the atmosphere, does not predict future emissions.	None
U.S. Extractive Industries Transparency Initiative (USEITI)	Publishes data for federal and non-federal oil, gas, LNG and coal resources. Includes production volumes, non-tax revenue derived from federal production and federal disbursements of revenue showing where the money generated from non-tax revenue on federal lands goes.	Publishes data for federal and non-federal oil, gas, LNG and coal resources. Includes production volumes, non-tax revenue derived from federal production and federal disbursements of revenue showing where the money generated from non-tax revenue on federal lands goes.	• None	Non-tax revenue derived form federal oil, gas and coal development including disbursements to states.

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Exhibit 3:

Look Before You Lease; Reducing Fossil Fuel Dominance on Public Lands by Accounting for Option Value.

New York University School of Law; Institute for Policy Integrity.

Look Before You Lease

Reducing Fossil Fuel Dominance on Public Lands by Accounting for Option Value

Institute *for* Policy Integrity
NEW YORK UNIVERSITY SCHOOL OF LAW

January 2020

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Executive Summary

The Department of the Interior's (Interior) practice of leasing public lands for energy development has been criticized in recent years for failing to deliver a fair return to taxpayers, for unduly prioritizing fossil fuel development over environmental preservation, and for contributing to climate change. During the Trump administration, Interior's flawed fossil fuel leasing system has also led to an uptick in speculative leasing, whereby private oil and gas companies purchase leases at very low cost, enabling them to time production decisions to be privately optimal, as opposed to publicly optimal.[1] Speculative leasing ties up federal land for mineral resource production, often making that land unavailable for other beneficial uses including wildlife protection, ecosystem conservation, recreation, reforestation, and renewable energy production.

In 2017, more than 25 million acres of onshore federal land were devoted to oil and gas leases,[2] but fewer than 13 million acres were actually in production.[3] Moreover, nearly one-quarter of all acres leased by Interior's Bureau of Land Management (BLM) in the past decade were obtained through noncompetitive leasing, for just $2 per acre.[4] Private oil and natural gas companies engage in the practice of speculative leasing, at least in part, because they account for option value in their leasing and production decisions. Option value is the informational value gained by delaying decisions that are characterized by uncertainty and irreversibility, such as when and on what terms to sell or develop mineral resources. While private energy companies routinely account for option value, which explains the phenomenon of speculative leasing, the federal government currently fails to account for option value in its public land management processes, resulting in suboptimal environmental, social, and economic outcomes for the American public, to whom these lands belong.

The Trump administration's goal of "energy dominance" has increased the rate and amount of public lands available for oil and gas development, but without any effort to modernize the leasing system.[5] BLM's mineral resource leasing program has long been criticized for lack of competition for leases, low bid prices, low royalty rates, and failure to account for the option value of leasing.[6] The nearly 12 million acres of land made available for bidding in fiscal year 2017 was more than *three times* the average acreage from the last four years of the Obama administration.[7] At the same time, the American West is losing natural lands at a rapid clip: a football-field-sized natural area every two and a half minutes.[8] And nearly a quarter of the country's total greenhouse gas emissions come from public lands, due to fossil fuel extraction, transportation, and consumption of those resources.[9]

The environmental and social effects of the recent escalation in oil and gas leasing are myriad, and often, the full extent of these effects is uncertain. As just one example, recent analysis found that 60 percent of oil and gas leases offered in the West by the Trump administration are in areas of high water stress, posing a potential threat to the water security of farmers, ranchers, and local communities.[10] And continuing to lease public lands for fossil fuel extraction exacerbates climate risks, including more frequent and severe droughts and floods, accelerated melting of glaciers, and sea level rise.[11] Yet, even as leading scientific reports warn of the severe dangers of continuing a "business as usual" approach to fossil fuel production and consumption, BLM—under the Trump administration—is irrationally rushing to sell even more public land for mineral extraction.

This report explains how option value can and should be factored into BLM's land use planning and lease sale processes. By being far more strategic about timing and resource tradeoffs, BLM could significantly improve its public land stewardship, better protect environmental values, and regain some of the economic and strategic advantages that it has ceded to private developers. This report proceeds in five parts.

Part I introduces the concept of option value and elaborates on its relevance in the context of natural resources policy. Notably, while Interior's Bureau of Ocean Energy Management (BOEM) has taken initial steps to account for option value in offshore leasing, BLM has yet to do the same for onshore leasing. However, there are a number of ways in which option value is relevant to BLM's decisionmaking and land use management.

Part II summarizes the statutory framework that informs BLM's onshore energy leasing, focusing on the Federal Land Policy and Management Act's (FLPMA) principles of multiple use and fair market value and its regional planning requirements; lease sales held pursuant to the Mineral Leasing Act (MLA); and the parallel environmental review processes mandated by the National Environmental Policy Act (NEPA).

Part III examines the current state of BLM's land management program. Under the Trump administration, the federal government has dramatically expanded its public land lease sales, without modernizing its antiquated bidding and valuation process, and without adequately considering countervailing public land values, such as land and water conservation, carbon sink status, wilderness values, and renewable energy development.[12] At the same time, speculative leasing by private developers—many of which are multinational corporations—is on the rise, and underscores how private developers account for option value, whereas BLM fails to do so in its regional planning and lease sale processes, with undesirable consequences for the environment and federal taxpayers.

Part IV proposes recommendations for how BLM should address the foregoing issues. Accounting for option value at the regional planning stage would require BLM to make only high-potential lands, if any, available for leasing, update its regulations concerning areas of critical environmental concern (ACECs), and more robustly account for other environmental and social considerations, including managing public lands for carbon sink potential, wilderness characteristics, and energy reserves. To improve its lease sale procedures, in the event it continues leasing public lands for oil and gas extraction, BLM should account for option value when setting the fiscal terms of any new leases and setting lease stipulations, and when evaluating lease renewals, extensions, and suspensions. As a result, taxpayers would be better compensated for their relinquished public option to devote the land to an alternative use or delay leasing altogether, and companies would have less incentive to hold speculative tracts, as they would pay more for the right to do so.

Finally, Part V explores a series of case studies that illustrate the value of accounting for option value at both the regional planning and lease sale stages. The regional management plan (RMP) examples demonstrate the need for option value to be incorporated into regional planning at the outset, in order to protect environmental and social values, especially in contexts of uncertainty. For example, BLM should have considered the uncertainty surrounding potential permanent damage to paleontological resources within the Kanab Escalante Planning Area if mineral development is allowed to proceed. And in preparing its Carlsbad, New Mexico RMP, the agency should have considered the irreversible and costly consequences of opening up areas to oil and gas drilling that are already susceptible to sinkhole collapse and groundwater contamination, each of which may far outweigh the potential benefits of drilling. The lease sale case studies highlight the nearly irreversible nature of leases and the myriad costs that can be avoided if BLM were to consider option value before granting or renewing leases. For instance, in the Badger-Two Medicine case study, BLM acknowledged that it erred in leasing the parcels without more environmental analysis and cancelled them after 30 years of suspension, but the prospective developer lessees embarked on a protracted legal challenge to keep the leases. These case studies underscore the need to "look before you lease," in order to manage public lands in the public interest, as BLM is statutorily directed to do.

I. Option Value: The Informational Value of Delay

Option value is the informational value gained by waiting to make an irreversible decision. Option value arises in situations that are characterized by two features: uncertainty and irreversibility. *Uncertainty* is present when the expected value to be derived from a given action may change, or when the costs and benefits associated with the action are subject to doubt. *Irreversibility* is present when the action cannot be undone, or when the action entails sunk costs that make the prospect of reversal highly improbable. Under these conditions, the passage of time will often reduce uncertainty about the expected value of the irreversible action, by revealing more precise details regarding its costs and benefits.[13]

Option value is present in a wide variety of settings. The concept is firmly established in economic literature,[14] and a number of economists have examined its relevance to natural resources policy, specifically.[15]

Option value can and should play an important role in the government's approach to leasing federal lands for fossil fuel development, which is characterized by both uncertainty and irreversibility. The extraction and use of nonrenewable resources, such as coal, oil, and natural gas, cannot be undone; destruction of habitat for an endangered or threatened species may have irreparable consequences; and heat-trapping greenhouse gases released during fossil fuel extraction and consumption persist in the atmosphere for thousands of years, contributing to planetary warming and weather changes.[16]

BLM holds, on behalf of the American public, a perpetual option to lease its fossil fuel resources to private developers for mineral extraction. When the government sells the right to develop a tract to a private lessee, it extinguishes the perpetual option that it holds on behalf of the American people, and sells a time-limited option to a private actor, valid for the duration of the lease. A typical lease term is 5 to 10 years for the initial term of an oil or natural gas lease, and even longer if the lease is extended; moreover, producing leases are extended automatically, pursuant to regulation.[17] The value associated with the option to delay can be large, especially when there is a high degree of uncertainty about price, extraction costs, and the social and environmental costs imposed by drilling.

The uncertainties associated with designating and leasing public lands for mineral resource production are numerous, and include:

- Competing uses of the public lands, including recreational activities, conservation, management as carbon sinks, renewable energy development, and cultural and tribal use;
- Environmental conditions and risks from drilling, including local pollution, greenhouse gas emissions, water use and shortages, and habitat effects;
- Future resource prices in the United States and in global energy markets;
- Current and expected effects of climate change on the ecosystem, which influence environmental sensitivities;
- Safety, pollution-capture, and other drilling technologies;
- Information on the cost of drilling in the region and bringing resources to market;
- Energy efficiency, energy conservation, and fuel economy standards that affect fossil fuel demand; and
- Laws and regulations governing drilling and development on public lands, air pollution, climate change, endangered species, and other environmental and social concerns.

As the foregoing list illustrates, a full accounting of option value incorporates economic, environmental, and social considerations.[18]

While private companies routinely account for option value, timing their purchasing and development decisions to be privately optimal, BLM fails to account for option value in its land use planning and lease sale processes. As a result, BLM relinquishes its option value to private developers, which gain a windfall, to the public's detriment. Option value explains the routine practice of companies purchasing tracts and waiting years to develop them, when conditions are optimal from their perspective, if they ever do develop them.

In *Center for Sustainable Economy v. Jewell*, the United States Court of Appeals for the D.C. Circuit affirmed the applicability of option value to the U.S. Bureau of Ocean Energy Management's (BOEM) offshore leasing planning process, stating:

> More is learned with the passage of time: Technology improves. Drilling becomes cheaper, safer, and less environmentally damaging. Better tanker technology renders oil tanker spills less likely and less damaging. The true costs of tapping [outer continental shelf] energy resources are better understood as more becomes known about the damaging effects of fossil fuel pollutants. Development of energy efficiencies and renewable energy sources reduces the need to rely on fossil fuels. As safer techniques and more effective technologies continue to be developed, the costs associated with drilling decline. There is therefore a *tangible present economic benefit to delaying the decision to drill for fossil fuels to preserve the opportunity to see what new technologies develop and what new information comes to light.*[19]

The Court ultimately held that the methodology for quantifying option value was not yet "sufficiently established" to require BOEM to undertake a quantitative analysis,[20] but stated, "[h]ad the [quantitative] path been well worn, it might have been irrational for Interior not to follow it."[21] Three months before the D.C. Circuit's opinion was published, BOEM began devoting a full section of its five-year plan for offshore drilling to option value.[22] And in its proposed offshore leasing plan for 2017-2022, BOEM again endorsed the use of environmental option value, and applied it extensively to future offshore lease sales in a qualitative manner.[23]

The logic of the D.C. Circuit's decision is equally applicable to onshore leasing. Yet, BLM currently fails to account for option value in any manner, resulting in leasing too much public land too soon, and for too low of a price. As a result, BLM relinquishes option value to private developers who gain a windfall, to the public's detriment.

II. Background: Leasing Fossil Fuels on Federal Land

The statutory framework that controls the leasing of public lands for energy development is informed by the concepts of multiple use and fair market value. This framework directs Interior to account for environmental protection of public lands, even while fostering some mineral resource development. Yet for well over a decade, Interior has struggled to balance competing resource uses on public lands, and has too often prioritized mineral extraction over conservation and other equally important (if not more important) land uses.

A. Multiple Use and Fair Market Value Requirements

Enacted in 1976, the Federal Land Policy and Management Act (FLPMA) directs that federal land management adhere to the principles of multiple use and sustained yield.[24] FLPMA explains that "multiple use" requires "harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment with consideration being given to the relative values of the resources and not necessarily to the combination of uses that will give the greatest economic return or the greatest unit output."[25] The statute also mandates that Interior "shall, by regulation or otherwise, take any action necessary to *prevent unnecessary or undue degradation of the lands.*"[26]

FLPMA also requires that the United States "receive fair market value of the use of the public lands and their resources unless otherwise provided for by statute."[27] While "fair market value" is not defined in the statute, BLM's economic valuation handbook defines the term as "the most probable price . . . for which the specified property rights should sell after reasonable exposure in a competitive market under all conditions requisite to fair sale, with the buyer and seller each

The Chaco Culture National Historical Park in New Mexico is rich in cultural, historical, and scientific importance. In March 2018, BLM announced that it would hold an oil and gas lease sale that included dozens of parcels close to the Park. See Part V.B.

acting prudently, knowledgeably, and for self-interest, and assuming that neither is under undue duress."[28] In 1982, when Interior last convened a working group to assess its "fair market value" procedures, that group resolved that the term comprised the "value of 'the right' to explore and, if there is a discovery, to develop and produce the energy resource," not merely the value of the energy resource alone.[29]

In light of its multiple use and fair market value mandates, one might reasonably assume that BLM, acting knowledgeably and in its self-interest, would weigh economic, environmental, and social considerations in determining the value of federal lands—including option value.[30]

Similarly, the Mineral Leasing Act of 1920 (MLA) authorizes the Secretary of the Interior to implement lease terms as deemed "necessary to insure the sale of the production of such leased lands to the United States and to the public at reasonable prices, for the protection of the interests of the United States, for the prevention of monopoly, and for the safeguarding of the public welfare."[31] The MLA describes a policy of fostering private enterprise in the "orderly and economic development of domestic mineral resources,"[32] while also authorizing the Secretary of the Interior to issue regulations preventing "undue waste."[33] The legislative history of MLA reveals that Congress was concerned with the waste of oil and gas. In *Boesche v. Udall*, the Supreme Court observed, "The committee reports reveal that one of the main congressional concerns was the prevention of an overly rapid consumption of oil resources that the Government, particularly the Navy, might need in the future. . . . Conservation through control was the dominant theme of the debates."[34]

Together, FLPMA and MLA create an oil and gas leasing framework that directs Interior to account for both environmental protection and energy development, and to pay close attention to fair market value and the prevention of waste of resources. As Part IV describes, BLM could better carry-out these statutory duties by accounting for environmental, social, and economic option value in managing public lands.

B. Land Use Planning Requirements

In order to advance the principles of multiple use and fair market value, FLPMA directs BLM to develop and revise land use plans. The statute establishes nine broad criteria that BLM must consider during this process while leaving the details to agency discretion.[35] BLM carries out this responsibility by crafting resource management plans (RMPs), which "are designed to guide and control future management actions and the development of subsequent, more detailed and limited scope plans for resources and uses."[36]

BLM must manage its lands for a variety of uses, not primarily for oil and gas development.[37] One of the stated goals of FLPMA is to "preserve and protect certain public lands in their natural condition."[38] As the Tenth Circuit has held, "[i]t is past doubt that the principle of multiple use does not require BLM to prioritize development over other uses."[39] The Court further noted, "[a] parcel of land cannot both be preserved in its natural character and mined."[40]

BLM regulations describe the objective of resource management planning as adhering to the multiple use framework:

> The objective of resource management planning . . . is to maximize resource values for the public through a rational, consistently applied set of regulations and procedures which promote the concept of multiple use management and ensure participation by the public, state and local governments, Indian tribes and appropriate Federal agencies. Resource management plans are designed to guide and control future management actions and the development of subsequent, more detailed and limited scope plans for resources and uses.[41]

Although BLM regulations give some shape to these statutory directives, they also allow for considerable discretion.[42] The regulations call for a decentralized process in which BLM field managers prepare and revise RMPs, with the agency's state directors providing limited oversight.[43]

BLM's Land Use Planning Handbook supplies additional details on the steps that staff should take to produce or amend RMPs, which include the following: prepare to plan, conduct scoping, analyze the management situation, formulate and analyze the effects of alternatives, select a preferred alternative, prepare a draft RMP and draft environmental impact statement (EIS), prepare a proposed RMP and final EIS, and prepare a record of decision for an approved RMP.[44] "Multiple use" is also a guiding principle for RMPs as described in the BLM handbook.[45]

Because the RMP process requires extensive coordination with state and local governments and conversations with various stakeholders, an RMP can require years to complete.[46] The planning process is "middle tier" in nature: RMPs are subordinate to national policy, but they control lower-level plans.[47]

New RMPs and revisions to RMPs require BLM to prepare an EIS, as they are deemed "major Federal actions significantly affecting the quality of the human environment," which must comply with the National Environmental Policy Act (NEPA).[48] More modest amendments to RMPs require either an EIS, or more commonly, a shorter environmental assessment (EA), often followed by a finding of no significant impact (FONSI).[49]

New and revised RMPs are proposed as a "Draft RMP/Draft EIS," which pursuant to NEPA, must include: 1) the proposed action's environmental impact; 2) unavoidable adverse effects of the proposed action; 3) alternatives to the proposed action; 4) the relationship between local short-term environmental uses and long-term productivity; and 5) any irreversible resource commitment the proposed action entails.[50] There is generally a 90-day comment period for the Draft RMP/Draft EIS. BLM then releases a Proposed RMP/Final EIS, and BLM must allow for a short protest period (generally 30 days) and 60-day Governor's Consistency Review period. Finally, BLM prepares a Record of Decision/Approved RMP.[51]

Because the RMP revision process is so closely intertwined with EIS preparation, it is an important opportunity for BLM to consider the informational value of delaying mineral development in certain areas if, for example, BLM finds that there are environmental, social, or cultural risks, uncertainties, or disadvantages to allowing resource extraction. Indeed, NEPA expressly calls for identification of any "irreversible resource commitment," as well as consideration of short-term versus long-term environmental uses and productivity. However, while commenters have requested that BLM consider a "delayed leasing" alternative in the draft RMP/Draft EIS process, BLM has yet to adopt such an approach.[52]

Instead, in past RMPs, BLM has designated large amounts of land—including land with low or no oil and gas potential—as open to leasing. The resulting speculative leases prevent conservation of environmentally valuable areas, as well as other valuable public land uses like renewable energy development, recreation, and long-term mineral reserves.

For example, even if oil and gas tracts are not developed, the mere presence of leases often precludes BLM proactively managing the area for wilderness characteristics or important wildlife habitat. Section 201 of FLPMA requires BLM to maintain an inventory of all public lands and their resources and other values, which includes wilderness characteristics.[53] Land management for wilderness characteristics entails closure to motorized vehicles, timber production, roads, and mineral resource production.[54] When conducting a wilderness characteristics inventory—sometimes as part of an RMP revision process—, BLM assesses parcels for the presence or absence of wilderness characteristics including their

size (roadless areas with over 5,000 acres of contiguous BLM lands are preferred), naturalness, and outstanding opportunities for either solitude or primitive and unconfined recreation.[55] Yet in several instances, the presence of mineral leases has foreclosed BLM from managing parcels for wilderness characteristics.[56]

C. Lease Sale Process

Based upon the management framework developed in the applicable RMP, BLM decides which (if any) parcels to offer to private energy developers in lease sales. If BLM decides to hold a lease sale, it must follow the requirements of MLA and all other applicable laws and regulations, including NEPA.

BLM usually prepares EAs for oil and gas lease sales, as opposed to more in-depth EISs.[57] These EAs generally have 30-day public comment windows. In preparing for a lease sale, the applicable BLM state office sends a list of land parcels, based on land nominated by the public, to the district where the parcels are located. The district staff prepares an EA, describing the affected environment and environmental consequences of each alternative considered. This analysis includes estimates of air pollutants and effects on water resources, wildlife, cultural resources, and more.[58] However, EAs are not as detailed as EISs. BLM uses reasonably foreseeable development scenarios to project the expected number of wells; acreage disturbed; emissions; and other environmental and social effects for BLM's proposed lease sale, as well as the alternatives considered in the EA, including the "no action" alternative (in which a lease sale is not held). The EAs prepared for lease sales gives BLM another opportunity to evaluate option value, including by assessing the environmental, social, and economic costs and benefits of a delayed lease sale alternative; however, BLM has not yet embraced this approach.

Based on the nominated parcels and the EA, BLM decides which parcels to make available for leasing and which protective stipulations, if any, should be attached to each parcel.[59] BLM conducts additional, site-specific NEPA analysis when an exploration or development proposal is submitted.

BLM implements the previously described "fair market value" requirement at the lease sale stage.[60] As amended in 1987, MLA sets a national minimum bid price of $2 per acre for onshore oil and gas leases.[61] BLM is obligated to accept the highest bid on a tract of land put up for auction, so long as the bid meets the national minimum.[62] Although MLA enables the Secretary of the Interior to establish a higher national minimum bid price,[63] this authority has never been exercised.[64] The developer that submits the highest bid in a competitive leasing process pays the given amount, commonly called the "bonus bid," in exchange for an exclusive lease. A company in possession of a non-producing, onshore lease on public land must pay an annual rental fee of at least $1.50 per acre during each of the first five years of the rental term, and at least $2 per acre each subsequent year.[65] Current BLM regulations set annual rents at these statutorily provided minimums.[66] When resource production begins, the rent requirement gives way to royalty payments.[67]

III. The Problem: Leasing Low-Potential Land Is a Bad Deal for the Environment and Taxpayers

With a notable exception for parcels known or suspected to possess high development potential, the fiscal terms attached to federal leases are typically undemanding, such that most lease sales bring in very modest returns for the federal government. Nonetheless, after several years of steady decline in lease offerings, the federal government has drastically expanded the availability of public lands for energy development. This shift has further incentivized the phenomenon of speculative leasing—leasing by entities with little to no expectation of producing oil or gas in the short term. Private actors engage in speculative leasing largely because they account for option value, the informational value of delay, whereas BLM does not. This failure on the part of BLM manifests in both the planning and lease sale phases, with undesirable consequences for the environment and federal taxpayers, alike.

A. Federal Onshore Leasing Practices and Recent Trends

Under BLM's federal leasing program for oil and gas development, a firm's decision whether to acquire the mineral rights for a tract of land is primarily shaped by two fiscal components: bids and annual rental payments. Using data from BLM, a 2016 report by the Congressional Budget Office offered some insight into bidding trends:

> Auction results indicate that parcels vary widely in their attractiveness to bidders. Of the more than 25,000 federal leases issued between 2003 and 2012, approximately 85 percent were leased competitively, yielding bonus bids. Of those competitive leases, slightly more than one-quarter were leased at the minimum of $2 per acre. For the other three-quarters, the median bonus bid was $37 per acre, and the average bonus bid was $300 per acre; the average is much higher than the median because some parcels were leased at bids above $5,000 per acre.[68]

These figures indicate that while some parcels attracted sizable bonus bids, most leases were obtained for relatively modest amounts, with approximately 20 percent of leases going for the statutory minimum of $2 per acre. Speculative leasing is common at the low end of the price spectrum. For some developers, a low, one-time bonus bid followed by annual rental payments of $1.50 or $2 per acre is a small price to pay for even a small chance at discovering economically recoverable oil and gas, or at least preserving the option to explore and drill later.

The existence of speculative leasing under BLM's current leasing program is revealed by recent data. As of the end of fiscal year (FY) 2017, more than 25 million acres of federal land were locked up in oil and gas leases,[69] but fewer than 13 million acres were actually in production.[70] Thus, more than half of the land out on lease was lying idle. Industry developed only 8 percent of parcels that were leased for $10 per acre or less in one eight-year period, compared to 25 percent of parcels that were leased for more than $10 per acre.[71]

Moreover, the Trump administration's goal of "energy dominance" has entailed a significant increase in the availability of public lands for energy development.[72] After the Obama administration steadily curtailed federal lease offerings over the course of his second term, the current administration has unequivocally reversed course: the nearly 12 million acres of land made available for bidding in FY 2017 was more than three times the average acreage from the last four years of

Proposed leasing in the Coastal Plain of the Arctic National Wildlife Refuge entails numerous risks and uncertainties, including climate change consequences, effects on endangered species, and negative effects on the Alaskan Native Gwich'in population. See Part V.B.

the Obama administration, though fewer than 800,000 acres actually received bids—less than the respective historical average from the same preceding four-year period.[73]

Moreover, the percentage of leases being given away through noncompetitive sales surged in the first year of the Trump administration to the highest levels in over a decade.[74] In Nevada, more land is offered for lease at auction than in any other state except Alaska, but only 11% of leased parcels sold competitively in the last five years, and just 36 leases, covering 2.7% of leased acres, were producing at the end of 2018.[75] Speculative leasing is detrimental to both the environment and taxpayers, and the recent uptick in the practice of non-competitive leasing only exacerbates these issues.

B. Speculative Leasing Reveals that Private Actors Account for Option Value Where the Government Does Not

Private actors engage in speculative leasing—acquiring land that is unlikely to be developed in the near future, if ever—largely because they consider option value, whereas BLM does not. The *New York Times* recently explained the surge in speculative leasing as follows:

> The plots of land the speculators bid on typically sell for such dirt-cheap prices because there is little evidence that much oil or gas is easily accessible. *The buyers are hoping that the land will increase in value nonetheless, because of higher energy prices, new technologies that could make exploration and drilling more economical or the emergence of markets for other resources hidden beneath the surface.*
>
> *In some cases they hope to resell access to deep-pocketed oil companies at a premium. In others they are hoping to raise money to search for oil or gas on their own.* Either way, they are the latest in a long line of speculators willing to take a shot — sometimes a very long shot — at a big payoff in America's oil fields.[76]

In circumstances steeped with uncertainty, speculators recognize that there is significant informational value to be gained by delay. Developers are even willing to incur costs for the benefits that additional information may afford, especially where these costs (rental fees and bonus bids) are negligible compared to the expensive prospect of drilling. Based on its examination of expired leases, the Congressional Budget Office remarked, "[m]ost leaseholders do not choose to return the lease to BLM early but instead pay the rental fee and wait to see if new information becomes available that increases the likelihood that the parcel contains oil or gas."[77]

The game of speculation is risky for private developers,[78] but perhaps more detrimental to the public. Typically, the term of a lease will expire with relatively little in the way of new information, in which case low-potential land has been excluded from playing a more beneficial environmental or social role. In the occasional cases where delay proves to enhance the value of a lease, this additional value accrues disproportionately to the private developer. In fact, the government may have been better served by waiting to lease until a later date, when more information or other intervening factors, like higher resource prices or lower exploration costs, made it more valuable.

Option value aside, additional financial incentives can also spur oil and gas companies to purchase undeveloped federal land. In a 2018 report, the Center for American Progress detailed three reasons why companies may benefit from obtaining federal land, even with little or no intention of developing it: (1) to increase their booked undeveloped reserves, which can play a role in executive compensation; (2) to secure a higher acquisition price by listing a high value of undeveloped reserves on their balance sheet; and (3) to receive more favorable lending terms on long-term loans.[79] With such incentives, and in the face of BLM indifference, public lands become a mere poker chip for private developers, to the detriment of the public interest.

C. BLM Fails to Account for Option Value in Regional Planning, at the Expense of the Environment

Despite a statutory background that requires robust attention to environmental protection, current BLM practices suggest that, in reality, development considerations often take precedence in the planning process, to the detriment of preservation. BLM often treats undeveloped leases and even mere development potential on federal lands as foreclosing action that would benefit other uses, like recreation and conservation;[80] by contrast, areas acknowledged to have significant environmental or cultural value must satisfy demanding criteria in order to be ruled off-limits for energy development due to, for example, designation as an Area of Critical Environmental Concern (ACEC) or an area with wilderness characteristics.[81]

FLPMA defines ACECs as follows:

> [A]reas within the public lands where special management attention is required (when such areas are developed or used or where no development is required) to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards.[82]

In a 2017 article, Karin Sheldon and Pamela Baldwin juxtapose the congressional vision of ACECs as a powerful conservation tool with BLM's inconsistent treatment of this environmental designation, which results in undervaluation of ACECs in the RMP process.[83] The authors identify the Reagan administration's issuance of new FLPMA regulations in 1981 as a principal source of the problem: ACECs were not yet firmly established in BLM's land management policy at

this point, and the new regulations weakened or removed many of the relevant substantive provisions set out in the original 1979 regulations.[84] The enduring effect of the 1981 regulations is reflected in both significant deficiencies in current regulations and guidance[85] and by highly variable treatment of ACECs by BLM staff in the field.[86]

BLM's apparent bias towards development is all the more problematic in light of the fact that areas with low or no potential for oil and gas development are not only frequently available for leasing in RMPs, but often *are* leased by speculators hoping to turn a profit based on the possibility that the future unfolds in their favor.[87] BLM's own guidelines suggest a presumption towards non-development uses in such areas. But in fact, BLM "tends to set less protective conditions for leasing in areas with no or low development potential" than for areas of higher potential.[88]

The state of affairs appears to have further deteriorated since the Trump administration came into office, with private parties obtaining leases for large swaths of land in relatively low-potential regions like Nevada and eastern Montana, for instance.[89] These leases preclude potentially more valuable uses, such as renewable energy production or management for wilderness characteristics, while the land sits idle.

For instance, the presence of mineral leases and access roads have foreclosed areas from being managed for wilderness characteristics. In 2015, BLM released a Wilderness Characteristics Inventory Review of the Vale and Lakeview Districts. BLM found that one 15,785-acre unit was, "found to be in an unnatural condition [and therefore lacking wilderness characteristics] due mainly to mineral exploration and mining within the western portion of the unit. No attempt was made to isolate this unnatural portion of the unit from what on the map appears to be a remaining natural portion that is greater than 5,000 acres."[90] And in the Grand Junction Proposed Resource Management Plan in Colorado, BLM noted that even *undeveloped* leases on low-potential lands could interfere with management for wilderness characteristics, stating:

> 139,900 acres of lands with wilderness characteristics have been classified as having low, very low, or no potential. . . . While there is no potential for fluid mineral development in most of the lands with wilderness characteristics units, the majority of the areas, totaling 101,100 acres (59 percent), are already leased for oil and gas development. While stipulations for fluid mineral development may apply to these leases under Alternative A, stipulations under Alternatives B, C, and D would not retroactively apply to the existing leases, just as closing the areas to fluid mineral leasing would not apply to existing leases.[91]

In other words, because BLM had already leased the land for mineral development, the land might not be suitable for wilderness protection. BLM has made similar statements in other RMP processes.[92]

In short, current BLM practices suggest that development considerations often take priority in the planning process, running counter to the "multiple use," public interest, and fair market value mandates in FLPMA and MLA.

D. BLM Fails to Account for Option Value at the Lease Sale Phase, Short-changing Taxpayers

When public lands are leased and proceed to go undeveloped, taxpayers receive payment only from the initial bid and very low annual rental payments. And, as previously discussed, bids are often trivial.[93] Indeed, the Congressional Budget Office determined that royalties accounted for 90 percent of the government's gross income from onshore leasing from 2005 to 2014.[94] In this light, leasing zero- and low-potential land is not in the public interest and fails to provide "fair market value" or a "reasonable price" for the use of public lands and their resources, as outlined by FLPMA and MLA, respectively.

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The decades-long controversy over the Badger-Two Medicine area in Montana illustrates that leases can be challenging and costly to reverse. See Part V.B.

As amended, MLA requires that all public lands available for oil and gas leasing first be offered in a competitive sale; however, if no bids are received for the land, or the highest bid is less than the national minimum acceptable bid, the land must be offered within 30 days for noncompetitive leasing.[95] In a noncompetitive sale, the first qualified applicant is entitled to the lease upon payment of an application fee of at least $75, with the lease to be issued within 60 days.[96] The noncompetitive leasing process deprives BLM of any bonus bid.

Recent developments suggest that noncompetitive leasing is reaching new heights. Because energy companies can nominate public lands for development, a company can nominate land, refrain from submitting a competitive bid, and then acquire the same land more cheaply in a noncompetitive sale. Leases being awarded through noncompetitive sales reportedly surged in the first year of the Trump administration to the highest levels in over a decade.[97] For example, in December 2017, a London-based oil and gas company purchased 67,000 acres of Montana land noncompetitively, paying merely annual rent of $1.50 per acre.[98] It is likely that the public will never see any financial return on this capitulation of its natural resources to private actors; the rate of production is low even on competitively leased lands. Yet unsurprisingly, the rate of production on non-competitive leases is lower yet: the Congressional Budget Office found that "[f]or parcels leased between 1996 and 2003, all of which have reached the end of their 10-year exploration period, only about 10 percent of onshore leases issued competitively and 3 percent of those issued noncompetitively entered production."[99]

IV. BLM Should Account for Option Value in Order to Protect Federal Land and Taxpayers

By modernizing its practices to account for option value, BLM can improve public land management and better adhere to its statutory mandates. While the agency's current failure to consider option value generates negative consequences in the planning and lease sale phases, the agency can and should consider option value at each of these phases, and can do so using existing legal authority. Accounting for option value would confer a broad range of public benefits at all phases.

A. BLM Should Account for Option Value in the Resource Management Planning Process

Land use planning provides the first opportunity for BLM to weigh whether public lands should be offered for energy development leasing, and if so, on what scale. An appraisal of option value at this stage would help BLM account for the uncertainty and irreversibility that characterize leasing for energy development. Such an approach would entail at least the following three changes from current practice: (1) make only high-potential lands available for leasing, if any; (2) reform ACEC practices to give environmental protection a fair stake in planning; and (3) actively explore other means of accounting for environmental and social considerations from the outset, such as valuing carbon sink attributes in land use planning, and reserving more sites for conservation and renewable energy development.

1. BLM Should Make Only High-Potential Lands Available for Leasing, If Any

In order to comply with its statutory obligation to manage lands for multiple use, BLM must refrain from making zero- and low-potential lands available for energy development. These lands would then be available for more beneficial uses, such as ecosystem conservation, carbon sink purposes, renewable energy development, watershed protection, and recreation. If at some point lands believed to possess zero- or low-development potential were discovered, in fact, to have high potential, BLM could then assess whether to amend an RMP to open them for leasing, based on a higher expected resource valuation. In such a scenario, the American public would have gained by retaining the valuable option to wait to decide whether to lease the lands at a later time. Notably, BLM can adopt this recommendation under its existing authority for RMPs and land use planning, without any statutory changes.[100]

Another benefit of eliminating zero- and low-potential lands from designation for mineral development is that doing so would be expected to curb non-competitive leasing by making far fewer acres available for lease in any one lease sale. The MLA currently mandates noncompetitive leasing when land does not receive any bids at auction,[101] but changing the characterization of land at the RMP phase would take it off the table for future leasing – whether competitive or noncompetitive.

2. *BLM Should Account for ACECs*

BLM can help restore environmental concerns to their proper stature in the land use planning process by better accounting for ACECs, a step that would simultaneously facilitate consideration of option value. Drawing on the results of both legal research and field review, Sheldon and Baldwin offer a series of recommendations that revolve around the dual objectives of recognizing ACECs as a land management program and improving agency implementation. Because ACECs can be any size, they could protect entire landscapes or small but critical corridors, providing the agency with flexibility and serving as a complement to congressionally designated areas that the agency is charged with managing.[102]

On the implementation front, BLM should rectify the fact that limited existing data on ACECs is scattered across multiple sources by promulgating new regulations and guidance that carry out FLPMA's mandate that the environmental designation receive priority in the land management process.[103] To fulfill Congress's robust vision of ACECs, national guidance should promote uniformity across offices on topics such as early identification of potential ACECs in the planning process, resource- and value-specific data collection, detailed discussion of ACEC considerations in draft and final RMPs and Federal Register notices, management to achieve the heightened protection required by FLPMA, facilitation of public participation, and compliance with the annual reporting requirement.[104]

Effective management and administration of ACECs would establish greater balance in the overall land management scheme, where current practices suggest that development considerations play an outsized role.[105] The greater protection required for lands with ACEC designations would likely exclude them from consideration for leasing early in the RMP process, furthering FLPMA's principles of multiple use and sustained yield. In the event that an ACEC overlapped with a region possessing high potential for energy development, a rigorous resource inventory process and environmental review would provide ample environmental and social information needed for an approximation of option value.

The Boundary Waters Canoe Area in Minnesota is the most visited wilderness in the United States. BLM should have accounted for option value before leasing land in the area to mining company Twin Metals. See Part V.B

By bringing increased uniformity to ACEC practices across the agency and elevating the importance of the environmental designation, BLM's adoption of a formal program approach would also help secure more funding for ACECs, strengthen their defensibility in review processes, and enhance their significance in regional planning.[106]

Congress voted to rescind updated BLM land use planning regulations issued in December 2016—the final product of an initiative that included review of ACEC regulations and guidance, and which spanned more than two years—through an exercise of the Congressional Review Act.[107] BLM could still attempt to update its ACECs regulations administratively, either by rulemaking or by amending the guidance provided in its handbooks and policy manuals. When the Congressional Review Act is used to eliminate rules, it prohibits agencies from reissuing substantially similar rules; thus, to the extent that any ACEC rules desired by BLM bear a strong resemblance to rules that were overturned by the Congressional Review Act, they could only be issued pursuant to an authorizing law passed after the Joint Resolution.[108] Updating guidance and policy documents poses no such hurdle, but these types of documents are less durable across different administrations.

3. BLM Should Account for Myriad Other Environmental and Social Uncertainties

As previously discussed, natural resource managers must often grapple with a wide range of uncertainties when weighing the costs and benefits of development, many of which pertain to environmental and social considerations.[109] BLM should incorporate these considerations in its efforts to account for option value. It is not enough for BLM to simply venture that an area boasts sufficiently high development potential to automatically justify leasing. At the RMP phases, these uncertainties include:

- Current and expected resource prices in the United States and in global energy markets;
- Environmental conditions and risks from drilling including local pollution, habitat effects, water use and shortages, and greenhouse gas emissions;
- Current and expected effects of climate change on the ecosystem, which affect environmental sensitivities;
- Information on the cost of drilling in the region and bringing those resources to market;
- Safety, pollution-capture, and other drilling technologies;
- Energy efficiency, energy conservation, and fuel economy standards that affect fossil fuel demand;
- Laws and regulations governing drilling and development on public lands, air pollution, endangered species, and other environmental concerns; and
- Competing uses of the public lands, including recreational activities, conservation, renewable energy development, cultural and tribal use

The more sources and extent of uncertainty and irreversibility, the greater the option value associated with the action is likely to be.

High option value weighs in favor of delaying development in any case, but should BLM elect to contemplate development in an RMP process, it must still undertake a full analysis of option value. As stated by the U.S. Court of Appeals for the D.C. Circuit in *Center for Sustainable Economy v. Jewell*, BLM should strive to undertake a quantitative analysis; where this is not possible, BLM should complete a qualitative analysis.[110] For instance, BLM might determine that although a region is not designated as an ACEC, environmental sensitivities, carbon sink value, renewable energy potential or other factors make the option value associated with waiting to lease significant, and place it off-limits to leasing in an RMP.

BLM could also adopt a "hurdle price" technique, like the one BOEM uses in its five-year plan for offshore leasing, to evaluate parcels where leasing could potentially be in the public interest if resource prices rise to certain levels and exceed likely environmental and social effects, including climate effects.[111] BOEM defines the hurdle price as, "the market price below which the social value of delaying to a future program exploration of a large field in the sale area would exceed the value of immediate exploration of those fields."[112] However, BOEM's hurdle price analysis quantifies only the uncertainty surrounding oil prices, and discusses other uncertainties only qualitatively.[113] BLM could improve upon this process by quantifying uncertainty for environmental and social factors, as well.[114] More staff experience with the resource inventory processes, such as that envisioned for ACECs, would facilitate the agency's more robust consideration of option value.

Further, as part of its parallel NEPA requirements at the RMP phase, BLM must consider several alternatives to its proposed action. Among these alternatives, BLM should consider a delayed leasing alternative that would make certain land areas unavailable for leasing now, pending more information on the environmental sensitivities of the area, climate change costs, and/or potential competing uses, such as renewable energy development and carbon sink value. BLM should also use option value to help define more environmentally and culturally-protective alternatives, and ideally, select such alternatives as the "preferred" alternative because of the wisdom of delaying irreversible decisions imbued with risk and uncertainty.

B. BLM Should Account for Option Value at the Lease Sale Stage

In addition to accounting for option value during the regional planning process, BLM should consider option value in the more precise factual context presented by specific lease sales, assuming some such sales continue even in the face of mounting climate costs. If BLM learns new information regarding, for instance, environmental or safety hazards, developmental value, carbon sink value, or cultural significance,[115] it is much more difficult to act on this information when land is already leased.[116] In light of the uncertainty and near-irreversibility associated with leases for mineral development, BLM should account for option value at the lease sale stage in the following ways: (1) offering only high-potential lands, if any, in lease sales; (2) modifying the fiscal terms of leases to reflect option value; (3) setting lease stipulations; (4) setting more stringent standards for lease extensions and renewals; and (5) standardizing procedures for lease suspensions.

1. BLM Should Offer Only High-Potential Lands, If Any, in Lease Sales

At the lease sale stage, BLM has another opportunity to determine which, if any, tracts to make available to private energy developers. Just because a given tract is eligible for mineral leasing pursuant to an existing RMP does not mean that BLM must offer it for lease. In fact, it may be advantageous for BLM to defer a lease sale altogether, pending more comprehensive environmental information, completion of a relevant cultural or scientific study, or more community input.

As discussed in Part V, the BLM Pecos District Office deferred thirty-one parcels from a September 2018 lease sale due to concerns about potential water contamination from oil and gas activity.[117] And for a series of BLM oil and gas lease sales near the Chaco Culture National Historical Park, lease sale protests and public opposition led BLM to defer some parcels until it could conduct more analysis on cultural sites within the proposed leasing area.[118]

Moreover, if BLM does hold a lease sale, it should offer only high-potential lands, if any, in such a sale. As discussed above in Part IV, the presence of leased tracts on BLM lands often forecloses BLM managing those areas for wilderness values,

important wildlife habitat, ACECs, and myriad other public uses. In light of its multiple use mandate, BLM should never offer low potential lands for leasing, and must manage some public lands for distinct (and potentially more important) land uses.

2. The Fiscal Terms of Leases Should Reflect Fair Market Value, Including Option Value

Interior should account for option value in setting the fiscal terms of any leases that are offered in order to lease land at fair market value, as required by FLPMA.[119] Specifically, minimum bids and rents should be raised to prices that reflect the public's relinquishment of an option for future alternative uses of the leased land.[120]

First, minimum bids should be increased so that the public is fairly compensated for its forgone option value. The Secretary of the Interior has never exercised its authority to increase minimum bids,[121] despite the fact that many winning bids are made at or near the national minimum. The Secretary should exercise his or her existing authority to increase minimum bids to better capture the full value of the government option,[122] and to reduce speculation.[123]

BLM should also increase rental rates beyond the statutory minimum. Its current rates of $1.50 or $2 per acre have not been updated since 1987,[124] and rent is the only payment that the government receives when land is acquired non-competitively and proceeds to go undeveloped. Moreover, the public should be compensated for externalities that arise after leases begin, but before royalty-producing quantities are generated.[125] Increasing rental rates will require Interior to change its regulations to allow BLM more flexibility in accounting for option value and externalities in setting future leases.[126]

3. BLM Should Consider Option Value When Setting Lease Stipulations

BLM should also account for option value when determining whether to attach stipulations to leases, and the content of such stipulations. Stipulations are a "necessary modification of the terms of the lease," that identify specific resource values to be protected in specific geographical areas.[127]

RMPs can provide some guidance for when stipulations should apply, but the decision to apply them is made at the lease sale for specific parcels.[128] Under existing authority, BLM can apply stipulations (such as those in the categories of 'no surface occupancy' or 'limited surface use') to parcels in order to protect ACECs, municipal watersheds, and other areas of concern to the public interest.[129] BLM can reduce some of the environmental and social risks and uncertainties that it uncovers through its option value assessment by requiring lease stipulations, such as "no surface occupancy" or methane capture stipulations, at the lease sale phase. BLM should consider the uncertainties and irreversibility of developing land in attaching lease stipulations, and account for the full range of externalities that affect the American public. Where the balance of factors weighs toward development, stipulations can allow for some protection and preservation of areas with environmental, social, and economic uncertainty (while offering less protection than simply not leasing in the area).

4. *BLM Should Have More Stringent Standards for Lease Renewals and Extensions*

BLM should consider option value at the end of every lease term instead of automatically granting renewals and extensions. This will require changing current BLM regulations. Currently, a lease "shall" be extended by BLM so long as oil or gas is produced from the lease in paying quantities.[130]

The criteria for when a lease renewal is granted differs based on whether a well has been drilled and hydrocarbons have been discovered. With a discovery of hydrocarbons, BLM may approve a ten-year lease renewal after the fifth year of the lease's primary term, even if BLM has determined that the well is *not* capable of producing oil or gas in paying quantities.[131] One must question the current wisdom of this regulation, as it allows private developers to effectively lock up public land for private use, without BLM having any expectation of royalty payments. Without discovery of oil or gas, a renewal application will be granted if BLM determines that the lessee has provided sufficient evidence of diligent pursuit of "exploration that warrants continuation of the lease with the intent of continued exploration or future potential development," or if the lease is part of a unit agreement that qualifies for renewal without discovery.[132]

Recent technological advances allow for more accurate predictions of where and to what degree parcels might reasonably yield developable assets. BLM should update its regulations to require greater certainty of production to justify a lease renewal or extensions. Moreover, BLM should revise its regulations to allow for far more discretion in determining whether to renew or extend a lease at all, whether producing or non-producing. There may be new countervailing risks, such as climate or water-related risks, which weigh strongly against lease renewals. BLM would recover some of its forfeited option value by amending its regulations to allow for a far more balanced review of leases up for renewal, rather than automatically signing off on more development, regardless of the net social benefits.

5. *BLM Should Standardize Procedures for Lease Suspensions*

BLM may approve a request for, or require, a suspension of activity under a lease. Like the cases of formal extension and renewals, suspension has the consequence of artificially extending the term of the lease.[133] BLM should consider option value before deciding to suspend a lease.

Suspensions can last indefinitely, and the time of the suspension does not count against the initial lease term.[134] Lease suspensions fall into three categories: suspensions of operations, of production, or of operations and production, the third being the most common.[135] Examples of reasons to suspend operations and production include: protecting or conserving natural resources, initiating environmental studies that prohibit the use of the lease, allowing for more time to decide on a proposal, or ongoing environmental litigation. Examples of reasons to suspend operations include: actions by other federal or state agencies, litigation, or BLM's denial of a proposal to operate for reasons other than for conservation of natural resources.[136] Many of these reasons involve uncertainty that could have, and ideally should have, been accounted for at earlier stages. In addition, the leaseholder can apply for a suspension if the failure to produce was due to circumstances beyond the lessee's control, even if the lease has a well that has not produced oil or gas despite being deemed capable of production.[137]

Members of Congress requested that the Government Accountability Office (GAO) review the lease suspension process, especially for leases that have been suspended for more than ten years. This stemmed from concerns that suspensions stymie oil and gas production or hinder alternative uses for the land, such as recreation.[138] As of September 2016, about 2,750 of approximately 41,000 oil and gas leases were suspended for various lengths of time, with the suspensions

President Trump removed nearly 2 million acres from the Grand Staircase-Escalante National Monument, pictured above, in 2018, rendering it a potential site for mineral lease sales. While litigation on the legality of the President's removal continues, BLM has sought to open the area to mineral leasing, despite paleontological, environmental, and economic uncertainties and risks. See Part V.A.

applying to about 3.4 million acres of land.[139] During suspensions, the land in question generally cannot be dedicated to other uses, such as conservation or renewable energy development.

BLM concurred with GAO's recommendations and responded that it would implement "improved lease suspension monitoring practices" in written policies and handbooks.[140] However, in some instances, lease suspensions are meant to address environmental and legal risks that arise during the lease term, and thereby underscore the need to consider option value earlier, at the RMP and lease sale stages. For example, in November 2019, BLM withdrew 130 oil and gas leases covering more than 175,000 acres in Utah, in response to a lawsuit filed by environmental groups claiming that the agency did not adequately consider the impacts of climate change from its leases.[141] As of November 2019, BLM Utah has suspended over 300,000 acres of leases in response to litigation.[142]

BLM should make lease suspension procedures and outcomes more transparent, as recommended by GAO in 2018.[143] In the meantime, the discrepancies and opacity in BLM's lease suspension procedures point to both the existence of uncertainty associated with leasing—including future negative impacts from developing the land—and the near-irreversibility of leasing, as suspensions can extend leases far beyond term limits.[144]

V. Case Studies

Option value is not merely an academic or theoretical exercise. As the following case studies demonstrate, accounting for option value at the regional planning and lease stage stages would result in more protection of environmental and social values, and help avoid costly mistakes. These case studies underscore the need to "look before you lease," in order to manage public lands in the public interest, as FLPMA requires.

A. The Importance of Option Value at the Regional Planning Phase

When BLM fails to account for uncertainties in its public lands planning process, it increases the potential for environmental, social, and economic harm and exposes itself to legal risk. It is crucial to account for option value during regional planning because risks and uncertainties affecting an entire region should be considered before opening up any constituent land to development. The case studies of the Kanab Escalante Planning Area and the Permian Basin in southeastern New Mexico illustrate the myriad uncertainties that should to be considered at the RMP phase.

1. Kanab Escalante Planning Area

The Kanab Escalante Planning Area (KEPA) constitutes 1.86 million acres of land in southern Utah that President Trump removed[145] from the Grand Staircase-Escalante National Monument (GSENM) in 2018, rendering it a potential site for mineral lease sales.[146] Debates over whether to make portions of KEPA available for leasing highlight (i) the many uncertainties around the economic, paleontological, and environmental impact of leasing the area, and (ii) the potential irreversibility of both known and unknown consequences of mineral leasing.

BLM's Preferred Alternative in its proposed RMP would open up 547,102 acres to mineral leasing with "moderate constraints" and another 104,972 acres to leasing subject to "major constraints."[147] BLM states that its Preferred Alternative "conserves the least land area for physical, biological, and cultural resources," designates no ACECs, and "is the least restrictive to energy and mineral development in KEPA."[148] The Preferred Alternative is also the most likely to increase the impacts on land adjacent to the Planning Area. BLM's endorsement of this alternative emphasizes the use of resources such as livestock grazing, timber harvesting, and even "casual surface collection of . . . paleontological resources for personal use without permits."[149] BLM did not analyze a delayed leasing alternative in its environmental review process for the RMP revision. Moreover, BLM's planning process failed to discuss or analyze several economic, scientific, and environmental uncertainties that are highly relevant to optimal management of the region.

First, it is uncertain how lucrative it will be to open KEPA to mining leases. For instance, the Preferred Alternative is projected to generate merely one additional job compared to the No Action Alternative, and identical labor income projections.[150] There is also debate as to the quantity of minerals KEPA could produce. The Utah Geological Survey assessment prepared for BLM states, "Future drilling is impossible to predict."[151] The study said that except for one play (a set of mineral resource accumulations that exhibit similar geological characteristics), the other plays surveyed presently lack one or more requirements for hydrocarbon accumulations. Therefore, "foreseeable development in these plays in the future is unlikely barring any new discoveries elsewhere in the region."[152] The survey was additionally skeptical about

the prospects for mining metallic minerals, tar sands, and coal. The region's 42.5% drop in coal production over the past decade further reduces the possibility that companies will seek to mine coal in KEPA.[153]

In addition to the economic uncertainties, there are several scientific and environmental uncertainties that should have been considered at the RMP stage. First, KEPA and the surrounding Grand Staircase Escalante National Monument hold tremendous paleontological significance, boasting a "nearly complete snapshot of the Late Cretaceous Period." Twelve dinosaur species have been named since the monument was established.[154] But as stated earlier, the Preferred Alternative allows for "casual collection" of fossils, and even acknowledges that "loss of [fossil] specimens other than common invertebrate and plant specimens is possible."[155] Paleontological resources are non-renewable and often occur in "intermittent concentrations," underscoring the need to preserve them from damage during mineral exploration and extraction.[156] Damaging paleontological resources is quintessentially irreversible.

This example also highlights the uncertainty surrounding the impact of mineral leasing in KEPA, as there is controversy over whether irreversible damage would occur. On the one hand, the Society of Vertebrate Paleontology opposed leasing permits anywhere in KEPA because "mineral extraction is one of the greatest threats to paleontological resources."[157] On the other hand, some question whether "casual collection" of fossils would negatively affect crucial paleontological studies.[158] Nonetheless, the existence of this uncertainty in the irreversible realm of fossil excavation increases the option value associated with opening the area to mineral development. Yet BLM's Preferred Alternative would, in the agency's own words, cause "greater potential for impacts on monument objects than other alternatives by allowing for greater access and more limited development."[159]

Second, Grand Staircase Escalante National Monument recently gained attention for its bee population, as 660 species of bees inhabit the area. It thus has the potential to be a crucial site for scientific study, especially in light of the uncertainty about the impact of possible declining bee populations.[160] It has proven difficult to monitor these populations due to the lack of historic records.[161] However, the monument is ideal for monitoring bee populations because of its natural landscapes, lack of habitat fragmentation, and wide array of bee species.[162] Last year, a study of bees in Grand Staircase Escalante National Monument was "one of the largest published bee surveys both in terms of geographic area covered and consecutive years sampled."[163] Developing KEPA will fragment this habitat and threaten a vital scientific endeavor to learn about bee populations, whose effects on ecosystems worldwide remain uncertain and a cause of anxiety.[164] However, the RMP and EIS do not mention the bee population or the risks to it from mineral development.[165] In addition to the irreversibility of harming habitats that are crucial for preserving a vulnerable animal population, the foregone opportunity for important scientific study would also be irreversible.

As BLM finalizes its RMP for KEPA, it should consider option value in the ways recommended in Part IV.A.[166] Specifically, it should strive to account for the myriad environmental and social uncertainties related to the land in this area. BLM should delay lease sales in order to learn more about these uncertainties, especially as the nature and extent of their associated impacts are in doubt and are likely irreversible.

2. Fracking in Southeastern New Mexico's Permian Basin

Another example underscoring the need for consideration of option value at the regional planning phase is that of the Permian Basin. The Permian Basin is the nation's largest oil field, extending into western Texas and southeastern New Mexico.[167] According to experts, the risk of water contamination associated with oil and gas activity is greater in the Carlsbad region of New Mexico than in other places where drilling occurs in the United States.[168] This area sits atop karst

limestone, through which water can carry pollutants farther and faster than on land with layers of sand and soil.[169] The area's incredibly rare geology, including its 119 underground caves, is the reason that Carlsbad Caverns was established as a national park in 1923.[170]

BLM's Carlsbad, New Mexico field office is one of the five most active for federal onshore oil and gas permitting. In 2018, BLM proposed opening an additional 86,000 acres for oil and gas extraction.[171] However, there are several uncertainties and risks associated with more drilling in this area, including groundwater contamination and sinkhole formation, each of which would have irreversible consequences.

New Mexico currently faces water stress equivalent to the 10th-most water-stressed country in the world, the United Arab Emirates.[172] But every day, 115 million gallons of "produced water" are drained from wells in the oil field, a mix of water released from rock formations and fracking fluids, about half of which is treated and recycled, and the other half injected into the hundreds of wastewater wells in the state meant for permanent disposal of the fluid.[173] Moreover, fracking each well requires approximately 34 million gallons of freshwater.[174]

Had option value been considered at the regional planning phase, BLM could have learned more about the rate at which drilling companies would use water, and the source of that water, particularly in water-stressed New Mexico.[175] Though the New Mexico Department of Energy, Minerals and Natural Resources said last year that there has never been evidence of groundwater contamination associated with fracking or wastewater disposal, there were almost 800 surface spills or leaks in Eddy and Lea Counties in 2017.[176]

Concerns about water contamination arose prior to a September 2018 lease sale, leading the BLM Pecos District Office to defer thirty-one out of the 173 proposed parcels to complete further analysis regarding cave karst and hydrological features. These parcels are thought to be connected to the Capitan Aquifer, which is Carlsbad's primary drinking water supply.[177] The Pecos District action is a rare example of option value employed the right way, at least with respect to the deferred parcels.

On top of the risks for groundwater contamination and increased water stress, fracking and related operations increase the likelihood of sinkhole formation, with profound impacts for highways and other infrastructure. In February 2018, the New Mexico state legislature approved funding to stabilize Highways 62 and 285, main thoroughfares, which face the risk of collapsing due to drilling-related activities in the Permian Basin. The stabilization effort is expected to cost about $40 million in total.[178] Experts estimate the bill for a collapse could be as high as $1 billion in damages, litigation and loss of life.[179] And some experts say that the collapse is inevitable.[180] Indeed, the region is already familiar with sinkhole formations caused by drilling operations: In 2008, two such caverns collapsed twenty-two miles and twenty-nine miles northeast of Carlsbad.[181]

The irreversible consequences of opening up too much of this land for drilling—including the possibility of sinkhole collapse at any moment and potential groundwater contamination—may far outweigh the potential benefits of drilling even from a purely economic standpoint. While the Permian Basin has produced much oil for the United States, it is unclear how much longer this profitability will last due to a lack of pipelines and infrastructure, alone, setting aside the serious environmental and social risks already discussed.[182] In drafting RMPs and determining whether to open up more land to oil and gas leasing, BLM must consider option value in order to reduce the risk of irreparable damage.

B. The Importance of Considering Option Value Before Leases Are Offered

Consideration of option value should not stop at the RMP phase. To reduce private speculation and confer myriad other public benefits, BLM should consider the value of learning more about uncertainties regarding specific parcels before leases are offered. The following examples demonstrate how accounting for option value before potential lease sales would reduce environmental, social, and cultural harms, as well as economic costs, including legal costs due to the nearly irreversible nature of leases.

1. Arctic National Wildlife Refuge

In December 2017, the 115th Congress, in a law signed by President Trump, directed the Secretary of the Interior to establish and administer a competitive program for oil and gas leasing in the Coastal Plain of the Arctic National Wildlife Refuge (Coastal Plain).[183] The law mandates at least two lease sales in the Coastal Plain, which must take place within four and seven years of the bill's enactment, respectively.[184] However, the numerous environmental, cultural, and economic uncertainties surrounding the effects of drilling in the Coastal Plain underscore the need to delay lease sales as long as possible. If lease sales must occur per the directive of the Tax Act, they should at least be delayed as long as possible so that BLM and Congress learn more about the irreversible impacts of drilling in the Coastal Plain.

First and foremost, drilling in what has been called "America's Serengeti" has irreversible environmental ramifications.[185] The Refuge is home to forty-two fish, thirty-seven land mammal, eight marine mammal, and more than 200 migratory and resident bird species (which migrate to all fifty U.S. states).[186] The Coastal Plain is especially critical to polar bears' livelihood as an increasingly popular denning site, with dens widely distributed throughout the region.[187] Indeed, the Refuge has the highest density of polar bear land dens in Alaska and is the only national conservation area where polar bear denning regularly occurs.[188] Glacier melt has recently led polar bears to abandon previous denning sites and congregate in the Coastal Plain.[189] With this recent trend, it would be especially risky to open this land to lease sales when the full impact of drilling activity on such a vulnerable species is unknown.[190]

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The lives and heritage of the Alaskan Native Gwich'in are directly tied to porcupine caribou herds. Because the Coastal Plain has never experienced oil and gas production, the full effects of potential development on the caribou herd and the Gwich'in way of life are uncertain.

The uncertainty is magnified by questions concerning the effects of seismic studies on glaciers. The last seismic study in the area occurred over thirty years ago,[191] and BLM claims that a new EIS on the effects of such studies is not needed due to the existence of previous studies.[192] However, the effects of past seismic tests have endured longer than anticipated.[193] As of 2009, five percent of the trails from 1984-85 seismic exploration had not yet recovered, amounting to 125 miles. New technology brings more uncertainties as well: Modern 3-D seismic trails, made by drill, vibrator and recording vehicles, require an even denser grid of trails than the 2-D trails used in 1984.[194] This new technology and equipment, untested in the Refuge, heightens the uncertainties associated with development in the sensitive region.

Increased activity in the Refuge also increases the risk of melting permafrost, which has significant climate change ramifications. Permafrost contains twice as much carbon as currently exists in the atmosphere, meaning that melting permafrost releases greenhouse gases that cause even more warming.[195] The potential to create dangerous climate "feedback loops" increases if the permafrost melts. The tipping points at which such negative feedback loops kick in are hard to predict, underscoring the uncertainty associated with intensive activity in the Refuge.[196]

In addition to environmental uncertainties, cultural risks and uncertainties abound. The Alaskan Native Gwich'in population is located in northeastern Alaska near the Coastal Plain. The culture and life of the Gwich'in has been based around the porcupine caribou herd for thousands of years. The Gwich'in have relied upon the caribou for food, shelter, clothing, tools and medicine, and have named the Coastal Plain "Iizhik Gwats'an Gwandaii Goodlit," which translates to "The Sacred Place Where Life Begins."[197] The porcupine caribou herd migrates to the Coastal Plain each year to birth and raise their young. The lives and heritage of the Gwich'in are directly tied to the caribou herds, and without a healthy caribou population, the Gwich'in culture would be threatened.[198] Because the Coastal Plain has never experienced oil and gas production, the full effects on the caribou herd and the Gwich'in way of life are uncertain.

Moreover, if allowed to proceed to a lease sale, it is unclear how much revenue drilling in the Coastal Plain would even produce. The Trump administration has claimed that drilling would produce $1.8 billion in revenues over ten years and directed the U.S. Geological Survey (USGS) to update their estimates of potential oil reserves underneath the Refuge.[199] However, the Center for American Progress (CAP) estimates a much more conservative $37.5 million in revenue over ten years. According to CAP, the area's remoteness and lack of existing oil infrastructure would not be conducive to oil production within the next ten years.[200] Thus, almost all of the revenue would come from bonus bids instead of royalties from oil production. CAP's conservative estimate also stems from the fact that oil companies will probably discount their bids due to uncertainty over the potential revenue from drilling, possible litigation or legislation to block drilling in the future, and the negative publicity likely to arise from drilling in the Coastal Plain.[201] Energy companies are unlikely to take costly risks, especially in the wake of Shell stopping its $7 billion Arctic exploration in Alaska three years ago after failing to find enough crude oil.[202] The costs associated with drilling are also unclear, as oil is scattered among multiple smaller fields, which makes development more expensive and potentially increases its environmental impact.[203]

In addition to uncertainty about revenue, there are also conflicting views on how much oil is actually capable of being recovered. The Congressional Research Service said that such estimates are "based on limited data and numerous assumptions about geology, economics, and . . . climate."[204] The estimates of the composition of prospective energy resources have also changed over time: USGS projected eight percent oil and ninety-two percent natural gas in 2010 in contrast to sixty-five percent oil and thirty-five percent natural gas in 2017.[205] Therefore, even factors that are taken for granted now can drastically change as technology and information evolve.

In short, there are countless good reasons for BLM to delay opening the Coastal Plain to lease sales as long as possible due to environmental, cultural, and economic value. The agency should convey these uncertainties to lawmakers and the public, rather than speed through the environmental review process, as it has been criticized for doing.[206] The stakes are simply too high to rush into drilling in the Refuge or to pursue aggressive development scenarios as BLM has done, to-date.

2. Badger-Two Medicine

The decades-long controversy over the Badger-Two Medicine area in Montana illustrates that leases can be challenging and costly to reverse, even when the leases were suspended for decades while further environmental review was conducted,[207] the land was not being developed, and most of the leases were eventually cancelled.[208] Set within a national forest, the Badger-Two Medicine area is bordered by Glacier National Park, the Bob Marshall Wilderness and the Blackfeet Indian Reservation. The leases in the 130,000-acre area were suspended in the 1980s.

Nineteen native tribes vehemently opposed drilling sacred land in the area,[209] leading Congress to eventually withdraw the area from mineral development in 2006 due to the surrounding land's cultural, environmental, and recreational value.[210] In 2014, the Blackfeet Tribal Business Council successfully advocated for the leases' cancellation.[211] In 2016, BLM concluded that the leases were improperly issued in violation of the National Environmental Policy Act and the National Historical Preservation Act, and that irreparable impacts could result from oil and gas development in the area.[212]

But the final two leaseholders, Solenex and Moncrief, filed suit and were granted reinstatement of the leases in November 2018.[213] In 2019, Moncrief reached a settlement with The Wilderness Society allowing for retirement of the disputed lease.[214] The sole remaining lease is held by Solenex; the federal government appealed the 2018 district decision reinstating that lease, and the appeal is pending in the D.C. Circuit as of November 2019.

Had BLM initially considered the informational value of delaying lease sales, it would have better understood the cultural, economic, and environmental risks of leasing the land, and in the end, could have saved significant legal costs. The fact that BLM suspended the leases for such a long period of time also factored into the *Solenex* court's decision to reinstate the leases despite the pre-lease violations of law. The U.S. District Court for the District of Columbia reinstated the leases because of the thirty-year suspension, for agencies must rescind decisions made by predecessors "within a reasonable amount of time" and "consider the substantial reliance interests at play."[215]

In the Badger-Two Medicine case, it became abundantly clear that there were better uses for the land than oil and gas development. The U.S. Forest Service, Advisory Council on Historic Preservation, and other government officials pushed to cancel the leases.[216] And yet, the reliance interests established in granting the leases rendered them nearly irreversible.[217] As such, it is crucial for BLM to consider what information might be gained through *before* a lease sale is finalized.[218] Preparation of an EIS or EA with a delayed leasing alternative could have assisted BLM in reaching this conclusion.

This case study also shows that even where a lease has already been granted, BLM should not automatically renew or extend leases, so as not to reinforce the leaseholder's reliance interests.[219] Finally, this case study exemplifies the need for transparency in the lease suspension process, for lack thereof can make a lease cancellation potentially more challenging.[220]

3. *Boundary Waters Canoe Area Wilderness*

The Boundary Waters Canoe Area (Boundary Waters) is the most visited wilderness in the United States, comprising 1,098,000 acres and more than 1,000 lakes in northeastern Minnesota.[221] It has also been a recent source of litigation against BLM. It was originally leased for mining in 1966 before NEPA was enacted, but environmental uncertainties increasingly arose as BLM contemplated whether to renew the leases.[222] Nonetheless, BLM renewed mining company Twin Metals' lease in May 2018, reversing a prior 2016 decision to decline renewal.[223] BLM faced fierce opposition after renewing the leases;[224] two lawsuits were filed the following month.[225]

One of the most pressing environmental uncertainties related to copper and nickel mining in the Boundary Waters is the impact of acid mine drainage on the waters, which was cited by the Forest Service when it refused to consent to the lease renewals in 2016, leading Interior to deny the lease renewals at the time.[226] The interconnected nature of the lakes in the region exacerbates uncertainties about the impact of sulfide mining, as well as the irreversibility of any harm that results from mining.[227] For instance, surface water in the leased area drains into the South Kawishiwi River—one of America's Most Endangered Rivers of 2013. Specifically, sulfates from sulfur can chemically convert mercury into methyl-mercury, a potent toxicant which bio-accumulates in the food chain.[228] Boundary Waters has already faced multiple fish consumption advisories, as 188 lakes had serious aquatic consumption impairments due to excessive mercury in fish tissue.[229] The pollution risk is even greater because of the low grade character of the rock formation, with sulfur-containing waste rock constituting about 99% of the ore, and copper and other valuable metals only 1 percent.[230]

Furthermore, it is unclear whether mining in the Boundary Waters would benefit or harm the local economy. Twin Metals anticipates employing 650 people in mining jobs and another 1300 in non-mining jobs.[231] However, the region has depended more on service-related employment in recent years, while mining employment has been more volatile.[232] Tourism in the region generates about $44.5 million annually and accounts for almost thirteen percent of all employment in St. Louis County.[233] Diminishing the pristine nature of the Boundary Waters, which is a primary draw for tourists, could harm the vital tourism sector.[234]

BLM discussed just two alternatives in its environmental assessment. The first ("Proposed Action") would add stipulations to the leases regarding exploration, drilling, and other surface use activities to protect surface resources. The second ("No-Action Alternative") would renew the leases under the same terms and conditions from 2004. In both alternatives, the leases would be renewed as a non-discretionary action outlined in the prior lease terms.[235]

In light of these risks, BLM should have accounted for option value when it initially leased the land to Twin Metals, and again when it contemplated renewing the leases.[236] BLM should not grant lessees the nondiscretionary right to renew leases. Such lease terms bind BLM to leasing decisions even in the face of uncertainties about the environmental impact of selling mineral leases far into the future.

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The public outcry for BLM to defer lease sales near the Chaco Culture Park in light of the archaeological and cultural value of the Park and the uncertainties inherent in drilling makes clear that BLM should have considered option value much earlier in the process.

4. Chaco Culture National Historical Park

The Chaco Culture National Historical Park in New Mexico was one of the first national monuments created by President Theodore Roosevelt and is a UNESCO world heritage site.[237] Over the course of 300 years, starting in the mid-800s, the Chacoans erected massive stone buildings surrounded by sacred landscapes and shrines.[238] This area served as an administrative and cultural hub, the reason that "many Southwest Indian people look upon Chaco as an important stop along their clans' sacred migration paths . . . ."[239] Long considered one of the best places for stargazing in the world, in 1991 the Chaco Culture Park established a night skies protection initiative and interpretive program to protect the night sky in the area, and in 2013 Chaco Culture was designated as an International Dark Sky Park.[240]

Notwithstanding the cultural, historical, and scientific importance of the area, BLM announced that it would hold an oil and gas lease sale in March 2018, including dozens of parcels close to the Chaco Culture Park.[241] BLM received 120 protests opposing the oil and gas lease sale. Tribal officials, environmentalists and others argued that the lease sites in question were too close to the Park and other sites they consider culturally significant.[242] BLM stated that it would defer the sale of 25 parcels on 4,434 acres in the area while it conducted more analysis on cultural sites within the proposed leasing area in response to protests.[243]

However, BLM announced plans to issue more oil and gas leases in March 2019, a number of which were within a 10-mile radius of the Park. A few days later, BLM announced that it was withdrawing the lease sales for sites within 10 miles of Chaco Canyon—the third such withdrawal for the leases closest to Chaco Culture Park.[244] However, the March 28, 2019 lease sale included thirty-seven parcels in New Mexico and nine in Oklahoma.[245] The Society for American Archaeology noted that parcels offered for lease outside the buffer zone hold Chachoan remains, and called for cancellation of the March 28 sale and all subsequent scheduled sales.[246] A representative from the National Parks Conservation Association said in response that the current administration was "playing a dangerous game of chicken with local communities and tribes."[247]

The National Congress of American Indians, the Navajo Nation, and the All Pueblo Council of Governors have called for a moratorium on drilling in the Greater Chaco Region, pending initiation and completion by BLM and the Bureau of Indian Affairs of an ethnographic study of cultural landscapes in the region. According to the National Congress of American Indians, approximately 90% of federal lands in the oil- and gas-rich San Juan Basin, of which Chaco Canyon is the geographical center, have already been leased for drilling.[248]

In May 2019, Interior Secretary David Bernhardt committed to a one-year moratorium on oil and gas development within 10 miles of the Chaco Culture Park.[249] Groups seeking protections for the ancient site said Bernhardt's pledge did not go far enough. In October 2019, the U.S. House of Representatives passed the Chaco Cultural Heritage Area Protection Act, which would ban future oil and gas drilling and mining activity on federal lands within a 10-mile buffer around the Chaco Culture Park.[250] The U.S. Senate has yet to vote on the legislation.

The public outcry for BLM to defer lease sales—numerous time—near the Chaco Culture Park in light of the spiritual, archaeological, and cultural value of the Park and the uncertainties inherent in drilling makes clear that BLM should have considered option value long before the lease sales were posted. BLM should cancel all forthcoming lease sales to learn more about the uncertainties regarding the value of the land, especially as mining could have irreparable ramifications. Moreover, BLM should consider the informational value that would arise from delaying the sales while it conducts more robust cultural and environmental studies. This could have also come to light, for instance, in exploring a delayed leasing alternative as part of a robust NEPA analysis at the lease sale phase, or through BLM's RMP amendment process. While some parcels closest to the Chaco Cultural Park have been spared for the time being, BLM must take its responsibility to "look before you lease" far more seriously.

Conclusion

BLM makes too much public land available for oil and gas leasing at low cost, and fails to account for the public's valuable option to wait and learn more about future events, including climate change, energy prices, technology, and more. Yet, private companies routinely account for option value, leading them to purchase large swaths of land at low prices, and thereby foreclosing potentially more valuable land uses.

This report suggests numerous ways in which BLM can and should account for option value at both the regional planning and lease sale stages. If BLM were to consider option value at the RMP and lease sale stages, more public land would be dedicated to beneficial environmental and social uses, and taxpayers would be better compensated for the lost option to use land at a later time. By accounting for option value before making irreversible decisions, BLM could also prevent irreparable harm to areas of significant cultural and ecological value, protect the public from unforeseen environmental and safety hazards, and reduce the legal costs of attempting to reverse misguided leasing decisions ex post.

Endnotes

[1] *See* Eric Lipton & Hiroko Tabuchi, *Energy Speculators Jump on Chance to Lease Public Land at Bargain Rates*, N.Y. Times (Nov. 27, 2018), https://perma.cc/UTG9-ETWD ("The percentage of leases being given away through noncompetitive sales . . . surged in the first year of the Trump administration to the highest levels in over a decade, according to an analysis of federal leasing data by Taxpayers for Common Sense.").

[2] U.S. Bureau of Land Management, Table 2 Acreage in Effect, https://perma.cc/Q3MV-FJ4M.

[3] U.S. Bureau of Land Management, Table 6 Acreage of Producing Leases, https://perma.cc/Q3MV-FJ4M.

[4] Center for American Progress, Backroom Deals: The Hidden World of Noncompetitive Oil and Gas Leasing (May 23, 2019), https://perma.cc/QSP8-SP74.

[5] Leases were decreasing at an average rate of 29% in the period of 2013-2016, and then increasing at an average rate of 61% in 2016-2018. *See* U.S. Bureau of Land Management, Table 11, Acreage Offered at Competitive Lease Sale Auctions since January 1, 2009, https://perma.cc/Q3MV-FJ4M.

[6] *See, e.g.*, Lipton & Tabuchi, *supra* note 1; Cooper McKim, *Trump Push For 'Energy Dominance' Boosts Drilling On Public Land*, NPR (Nov. 25, 2018), https://www.npr.org/2018/11/25/666373189/trump-push-for-energy-dominance-boosts-drilling-on-public-land; Timothy Puko, *Interior Secretary Nominee Says He Will Balance Energy, Environment*, Wall St. J. (Feb. 8, 2019), https://www.wsj.com/articles/interior-secretary-nominee-says-he-will-balance-energy-environment-11549634400; Jayni Foley Hein, *Federal Lands and Fossil Fuels: Maximizing Social Welfare in Federal Energy Leasing*, 42 Harv. Envt'l L. Rev. 1 (2018); Jayni Foley Hein, *Priorities for Federal Coal Reform: Twelve Policy and Procedural Goals for Programmatic Review*, Institute for Policy Integrity, N.Y. Univ. Sch. of Law (June 2016).

[7] *See* U.S. Bureau of Land Management, Table 11: Acreage Offered at Competitive Lease Sale Auctions Since January 1, 2009, https://perma.cc/Q3MV-FJ4M. However, fewer than 800,000 acres actually received bids—less than the respective historical average from the same preceding four-year period. *Id.*

[8] *See, e.g.*, Matt Lee-Ashley & Jenny Rowland-Shea, *Arctic National Wildlife Refuge 101*, Ctr. for American Progress (Oct. 10, 2017), https://perma.cc/SA7E-7LFG ("[T]he western part of the lower 48 states [is] already losing a football field of natural area every two and a half minutes.").

[9] U.S. Geological Survey, Federal Lands Greenhouse Gas Emissions and Sequestration in the United States: Estimates for 2005–14 (Nov. 23, 2018), https://perma.cc/4ARD-LLCE.

[10] Jenny Rowland-Shea, *Oil and Gas Development Is Creating a Problem for the Arid West*, Ctr. for American Progress (Nov. 12, 2019), https://perma.cc/6E9W-7T5K. The Center for American Progress found that, since the start of the Trump administration, BLM offered more than 5,550 oil and gas leases in the intermountain West. Of these leases, more than 6 in 10 have been in areas suffering from "high" or "extremely high" water stress, as defined by the World Resources Institute.

[11] Somini Sengupta, *Bleak' U.N. Report Finds World Heading to Climate Catastrophes*, N.Y. Times (Nov. 26, 2019), https://perma.cc/T5U5-TRSX.

[12] U.S. Geological Survey, *supra* note 9.

[13] For a straightforward illustration involving some mathematical calculations, see Michael A. Livermore, *Patience Is an Economic Virtue: Real Options, Natural Resources, and Offshore Oil*, 84 U. Colo. L. Rev. 581, 589–91 (2013) (describing how consideration of financial investment and weather forecasts can shape the decisionmaking process for two children deciding whether to set up a lemonade stand over the weekend).

[14] *See generally* Avinash K. Dixit & Robert S. Pindyck, Investment Under Uncertainty (1994).

[15] *See, e.g.*, Robert S. Pindyck, *Uncertainty in Environmental Economics*, 1 Rev. Envtl. Econ. & Pol'y 45 (2007); Kenneth J. Arrow & Anthony C. Fisher, *Environmental Preservation, Uncertainty, and Irreversibility*, 88 Q.J. Econ. 312 (1974).

[16] Christina Nunez, *Carbon Dioxide Levels Are at a Record High, Here's What You Need to Know*, Nat'l Geographic (May 13, 2019), https://www.nationalgeographic.com/environment/global-warming/greenhouse-gases/.

[17] *See* 43 C.F.R. §§ 3100.0-5; 3107.2-1.

[18] For an overview of how option value differs from non-use values, which can also inform environmental policy, see Livermore, *supra* note 13 at 597–601.

[19] *Center for Sustainable Economy v. Jewell*, 779 F.3d 588, 610 (D.C. Cir. 2015) (emphasis added). Policy Integrity served as counsel to Petitioner, Center for Sustainable Economy. *See also* Opening and Reply Briefs for Petitioner.

[20] *Id.* at 611.

[21] *Id.* at 612 ("Our holding is a narrow one. . . . [T]he agency is not permitted to substitute qualitative assessments for well-established quantitative methods whenever it deems such substitutions convenient.").

[22] *See* U.S. Bureau of Ocean and Energy Management, 2017-2022 Outer Continental Shelf Oil and Gas Leasing Draft Proposed Program (Jan. 2015) at 8-3 to 8-19, https://perma.cc/KZ28-VVF9.

[23] BOEM, Draft Proposed Program for the 2019–2024 Outer Continental Shelf Oil and Gas Leasing Program 10-3 to 10-16 (Jan. 2018), https://perma.cc/7C76-AYE4.

[24] 43 U.S.C. § 1701(a)(7) (instructing that "management be on the basis of multiple use and sustained yield unless otherwise specified by law"); *see also Our Mission*, U.S. Bureau of Land Management, https://perma.cc/MH7Q-W8C7 ("Congress tasked the BLM with a mandate of managing public lands for a *variety of uses* such as energy development, livestock grazing, recreation, and timber harvesting while ensuring natural, cultural, and historic resources are *maintained for present and future use.*" (emphasis added)).

[25] 43 U.S.C. § 1702(c).

[26] 43 U.S.C. § 1732(b) (emphasis added).

[27] 43 U.S.C. § 1701(a)(9).

[28] U.S. Bureau of Land Management, No. H-3070-2—Economic Evaluation of Oil and Gas Properties Handbook at I.B, https://perma.cc/4PZM-RVZH.

[29] U.S. Gov't Accountability Office, GAO-08-691, Oil and Gas Royalties: The Federal System for Collecting Oil and Gas Revenues Needs Comprehensive Reassessment 3 (2008).

[30] When considering whether or not to lease their land for fossil fuel development, a knowledgeable owner would also be expected to care about the externalities—such as potential air, water, and noise pollution—and account for these externalities in fixing the price and terms attached to a lease. By extension, as a decisionmaker for the American public at large, BLM should have an incentive to reduce externalities, or at least receive compensation for them, when ascertaining fair market value. *See* Hein, *Federal Lands and Fossil Fuels*, *supra* note 6, at 39–40 (2018).

[31] 30 U.S.C. § 187.

[32] *Id.* § 21a.

[33] *Id.* § 187.

[34] 373 U.S. 472, 481 (1963) (citing H.R. Rep. No. 206, 65th Cong., 2d Sess. 5; H.R. Rep. No. 398, 66th Cong., 1st Sess. 12-13). The Court proceeded to draw from a report on an earlier version of the bill that eventually produced the Mineral Leasing Act: "The legislation provided for herein, it is thought, will go a long way toward . . . reserv[ing] to the Government the right to supervise, control, and regulate the . . . [development of natural resources], and prevent monopoly and waste and other lax methods that have grown up in the administration of our public-land laws." *Id.* (alterations in original) (citing; H.R. Rep. No. 1138, 65th Cong., 3d Sess. 19).

[35] 43 U.S.C. § 1712(c); *see also* George Cameron Coggins, *The Developing Law of Land Use Planning on the Federal Lands*, 61 U. Colo. L. Rev. 307, 319 (1990). Coggins observes that section 1712 "specifies neither schedules, procedures, nor content of land use plans." *Id.* He goes on to contrast BLM's planning with that of the Forest Service, observing that the latter agency had extensive planning experience prior to the 1976 enactment of its primary planning statute, the National Forest Management Act, which turned out to be "far more encompassing and precise than the statutes governing the other [federal land management] agencies." *Id.* at 333.

[36] 43 C.F.R. § 1601.0-2.

[37] 43 U.S.C. § 1712(c)(1).

[38] 43 C.F.R. § 1701(a)(8)); *see also Pub. Lands Council v. Babbitt*, 167 F.3d 1287, 1299 (10th Cir.1999).

[39] *New Mexico Ex. Rel. Richardson v. BLM*, 565 F.3d 683, 710 (10th Cir. 2009).

[40] *Id.* (quoting *Rocky Mtn. Oil & Gas Ass'n v. Watt*, 696 F.2d 734, 738 n. 4 (10th Cir.1982)).

[41] 43 C.F.R. §1601.0-2.

[42] *See* 43 C.F.R. § 1601.0-5(n).

[43] 43 C.F.R. § 1601.0-4; *see also* Coggins, *supra* note 35, at 320 ("[BLM] claims that planning is totally decentralized, meaning that RMPs need not conform to any national model in promulgation or content." (footnote omitted)).

[44] *See* U.S. Bureau of Land Management, No. H-1601-1—Land Use Planning Handbook 17–25, https://perma.cc/4PZM-RVZH.

[45] *Id.* at 1.

[46] *See, e.g.*, U.S. Gov't Accountability Office, GAO/RCED-90-225, Public Lands: Limited Progress in Resource Management Planning 10 (1990), https://perma.cc/G3FN-CWDC [hereinafter GAO RMP Report] ("[T]he initial seven plans completed in Colorado took an average of 39 months to prepare. Seven to 24 months were needed to resolve protests before the plans were finally approved.").

[47] Coggins, *supra* note 35, at 319.

[48] 42 U.S.C. § 4332; *see also* BLM, Land Use Planning Handbook, *supra* note 44, at 16.

[49] BLM, Land Use Planning Handbook, *supra* note 44, at 16.

[50] *See id.*; 42 U.S.C. § 4332.

[51] BLM, Land Use Planning Handbook, *supra* note 44, at 17.

[52] *See, e.g.*, Letter from Institute for Policy Integrity at NYU School of Law to Carlsbad RMP Team Lead, Bureau of Land Management (Nov. 5, 2018), https://perma.cc/RE6D-5Q73.

[53] 43 U.S.C. § 1711.

[54] *See, e.g.*, BLM, Grand Junction Draft Resource Management Plan and Environmental Impact Statement, 4-256- 4-258 (Dec. 2012), https://perma.cc/Y6A6-KMDC.

[55] BLM, Manual Transmittal Sheet 6310—Conducting Wilderness Characteristics Inventory on BLM Lands (Public) 6-10 (2012), https://perma.cc/7HEY-4QE2 (Under "Specially Designated Conservation Areas and Wildlife" in drop-down menu).

[56] *See infra*, Part III.C. (describing BLM's assessment of leased areas when conducting wilderness characteristic inventories).

[57] *See, e.g.*, BLM, Environmental Assessment, DOI-BLM-NV-B000-2019-0006-EA, June 2019 Competitive Oil and Gas Lease Sale (Feb. 13, 2019), https://perma.cc/L8HE-KZZE.

[58] *See id.*

[59] *Id.* at 4.

[60] *See supra*, Part II.A.

[61] 30 U.S.C. § 226(b)(1)(B).

[62] 30 U.S.C. § 226(b)(1)(A) ("The Secretary *shall* accept the highest bid . . . which is equal to or greater than the national minimum acceptable bid, without evaluation of the value of the lands proposed for lease." (emphasis added)).

[63] 30 U.S.C. § 226(b)(1)(B).

[64] Congressional Budget Office, Options for Increasing Federal Income from Crude Oil and Natural Gas on Federal Lands 1, Apr. 2016, https://perma.cc/SEM7-PNA5.

[65] 30 U.S.C. § 226(d).

[66] 43 C.F.R. § 3103.2-2(a).

[67] 30 U.S.C. § 226(d); 43 C.F.R. § 3103.2-2(c).

[68] Congressional Budget Office, *supra* note 64, at 18.

[69] U.S. Bureau of Land Management, Table 2 Acreage in Effect, https://perma.cc/Q3MV-FJ4M.

[70] U.S. Bureau of Land Management, Table 6 Acreage of Producing Leases, https://perma.cc/Q3MV-FJ4M.

[71] Taxpayers for Common Sense, Locked Out: The Cost of Speculation in Federal Oil and Gas Leases (Oct. 3, 2017), https://www.taxpayer.net/energy-natural-resources/locked-out-the-cost-of-speculation-in-federal-oil-and-gas-leases/.

[72] *See, e.g.*, Lipton & Tabuchi, *supra* note 1; Cooper McKim, *Trump Push for 'Energy Dominance' Boosts Drilling On Public Land*, NPR (Nov. 25, 2018, 7:55 AM), https://www.npr.org/2018/11/25/666373189/trump-push-for-energy-dominance-boosts-drilling-on-public-land; Timothy Puko, *Interior Secretary Nominee Says He Will Balance Energy, Environment*, Wall St. J. (Feb. 8, 2019, 9:00 AM), https://www.wsj.com/articles/interior-secretary-nominee-says-he-will-balance-energy-environment-11549634400.

[73] *See* U.S. Bureau of Land Management, Table 11: Acreage Offered at Competitive Lease Sale Auctions Since January 1, 2009, https://perma.cc/Q3MV-FJ4M.

[74] Lipton & Tabuchi, *supra* note 1; *see also* Bobby McGill, *Nevada Becoming Wild West for Oil Speculation*, Bloomberg Envt. (Aug. 5, 2019), https://news.bloombergenvironment.com/environment-and-energy/nevada-becoming-wild-west-for-oil-speculation ("The administration has put more than 1.8 million acres of federal lands in Nevada on the auction block for leasing since March 2017, more than double the 818,000 acres leased in Nevada during the last four years of the Obama administration. Many of the leases are in regions that have little proven oil production potential, according to environmental group protests filed against the lease sales.").

[75] Taxpayers for Common Sense: Gaming the System: How Federal Land Management in Nevada Fails Taxpayers (July 2019), https://www.taxpayer.net/wp-content/uploads/2019/07/TCS-Nevada-Federal-Oil-Gas-Report_-July-2019.pdf.

[76] Lipton & Tabuchi, *supra* note 1 (emphasis added).

[77] Congressional Budget Office, *supra* note 64, at 19. The report recognized that while rental fees have the capacity to "promote efficiency by discouraging firms from 'warehousing' parcels simply to prevent competitors from exploring them," the fees "would have to be far greater than they are now to have such an effect." *Id.* at 9.

[78] *See, e.g.*, Lipton & Tabuchi, *supra* note 1 (quoting an executive at a Texas-based company, with leases to landholdings roughly the size of Rhode Island, to this effect).

[79] Ctr. American Progress, Oil and Gas Companies Gain by Stockpiling America's Federal Land 3 (2018), https://www.americanprogress.org/issues/green/reports/2018/08/29/455226/oil-gas-companies-gain-stockpiling-americas-federal-land/. There has been a trajectory towards increased speculation of undeveloped land, especially after an SEC rule in 2008 allowed companies to include undeveloped land in its disclosures for "proved reserves." *Id.* at 5–6, 14 (citing 17 C.F.R. § 210).

[80] The Wilderness Soc'y, No Exit: Fixing the BLM's Indiscriminate Energy Leasing 4 (2016), https://perma.cc/UMG7-KWPR; *see also* Lipton & Tabuchi, *supra* note 1 ("The speculation, critics say, allows companies to lock up millions of acres of federal land in leases, complicating efforts to set it aside for other uses.").

[81] The Wilderness Soc'y, *supra* note 80, at 5; *see also* U.S. Bureau of Land Management, Manual Transmittal Sheet 6310—Conducting Wilderness Characteristics Inventory on BLM Lands (Public) (2012), https://perma.cc/7HEY-4QE2 (Under "Specially Designated Conservation Areas and Wildlife" in drop-down menu); U.S. Bureau of Land Management, Manual Transmittal Sheet 6320—Considering Lands with Wilderness Characteristics in the BLM Land Use Planning Process (Public) (2012), https://perma.cc/7HEY-4QE2 (Under "Specially Designated Conservation Areas and Wildlife" in drop-down menu); U.S. Bureau of Land Management, Manual Transmittal Sheet 1613—Areas of Critical Environmental Concern (1988), https://perma.cc/7HEY-4QE2 (Under "General Management" in drop-down menu).

[82] 43 U.S.C. § 1702(a).

[83] *See generally* Karin P. Sheldon & Pamela Baldwin, *Areas of Critical Environmental Concern: FLPMA's Unfulfilled Conservation Mandate*, 28 Colo. Nat. Res. Energy & Envtl. L. Rev. 1 (2017).

[84] *Id.* at 31–32; *see also* Coggins, *supra* note 35, at 318 ("The regulations for planning promulgated during the Carter Administration were drastically revised under Secretary Watt and his successors in an attempt to streamline the process, limit public participation, and deemphasize planning.").

[85] *See id.* at 33–47. For instance, current planning regulations "rely solely on a cross reference to § 202 of FLPMA to incorporate the priority principles for ACEC planning. This failure to provide explicit and visible priority for ACECs in planning may result in a lack of adequate funding for ACEC data collection and management, a failure to consider some areas with ACEC potential, and a failure to designate and protect them." *Id.* at 38; *see also* 43 C.F.R. § 1601.0-8 ("The development, approval, maintenance, amendment and revision of resource management plans will provide for public involvement and shall be consistent with the principles described in section 202 of the Federal Land Policy and Management Act of 1976.").

[86] *See id.* at 47–58; *see also* GAO RMP Report, *supra* note 46, at 4 (observing that ACEC designations "were substantially dependent on the philosophical views of Bureau field managers, which varied considerably" and recounting that where one field office had applied the designation to a western juniper/sagebrush plant community considered common throughout many parts of the West, another field office had not applied the designation to a paleontological site containing pterodactyl foot tracks, one of only four such known sites in the entire world).

[87] The Wilderness Soc'y, *supra* note 80, at 5 (going on to furnish examples of no- to low-potential areas in four western states that are open to leasing).

[88] *Id.* at 3. For example, nominations of no- or low- potential areas under the purview of Colorado's Kremmling Field Office encountered opposition "based on inadequate protections for fisheries and water quality (June 2014), wildlife (August 2012) and permitted recreation activities (May 2013)." *Id.* at 6.

[89] Lipton & Tabuchi, *supra* note 1. Only "3 percent of the 715,441 acres of federal land in the state leased for oil and gas were actually producing energy as of late [2017]." *Id. Compare* Table 6 Acreage of Producing Leases *supra* note 3, *with* Table 2 Acreage in Effect, *supra* note 2.

[90] BLM, Wilderness Characteristics Inventory ReviewA Review of Vale and Lakeview District Conformance with Established Procedures for Maintaining the Inventory of Lands with Wilderness Characteristics 33-34 (Dec. 18, 2015), https://perma.cc/E7JM-KCBL.

[91] The Wilderness Soc'y, No Exit: Fixing the BLM's Indiscriminate Energy Leasing 4 (2016), https://perma.cc/UMG7-KWPR (citing BLM, Grand Junction Draft Resource Management Plan and Environmental Impact Statement, 4-256 (Dec. 2012)).

[92] *Id.* (citing the Colorado River Valley Resource Management Plan and Bighorn Basin Resource Management Plan in Wyoming).

[93] *See supra* Part III.A; *see also* Lipton & Tabuchi, *supra* note 1 ("Taxpayers get 12.5 percent of revenues produced from any oil or gas extracted from leased public land—or nothing but trivial rent payments if speculators fail to develop the land successfully.").

[94] Congressional Budget Office, *supra* note 64, at 2. Even here, taxpayers receive a relatively minimal benefit from production on federal land, as the federal onshore royalty rate of 12.5 percent "is less than the royalty rate imposed by many states for production of oil and gas on state-owned land. For example, current state royalty rates are 25 percent in Texas, 18.75 percent in Oklahoma, and 16.67 percent in Colorado, Montana, and Wyoming; New Mexico and North Dakota use both 16.67 percent and 18.75 percent rates." *Id.* at 20.

[95] 30 U.S.C. § 226(b)(1)(A).

[96] 30 U.S.C. § 226(c)(1).

[97] Lipton & Tabuchi, *supra* note 1; Center for American Progress, Backroom Deals, *supra* note 4.

[98] Lipton & Tabuchi, *supra* note 1.

[99] Congressional Budget Office, *supra* note 64, at 2.

[100] *See* 43 C.F.R. §§ 1601.0-2; 1601.0-8; 1610.5-5; 1610.5-6.

[101] *See supra* Part II.

[102] Sheldon & Baldwin, *supra* note 83, at 59 (further noting that "[i]n the past, many ACECs have subsequently become National Conservation Areas or National Monuments").

[103] *Id.* at 61–62 ("The legislative history of FLPMA, and early agency actions, support the interpretation that these priorities are both procedural . . . and substantive.").

[104] *See id.* at 61–64.

[105] *See supra* Part III.B.

[106] Sheldon & Baldwin, *supra* note 83, at 58–59.

[107] *Id.* at 32; Pub. L. No. 115-12, 131 Stat. 76 (2017). President Trump signed the associated Joint Resolution.

[108] 5 U.S.C. § 801(b)(2) (establishing that a rule subjected to a joint resolution of disapproval "may not be reissued in substantially the same form, and a new rule that is substantially the same as such a rule may not be issued, unless the reissued or new rule is specifically authorized by a law enacted after the date of the joint resolution disapproving the original rule").

[109] *See supra* Part I.

[110] 779 F.3d 588, 610 (D.C. Cir. 2015); *see also supra* notes 20-22 and accompanying text.

[111] *See* BOEM, Draft Proposed Program for the 2019–2024 Outer Continental Shelf Oil and Gas Leasing Program at 10-13 (Jan. 2018), https://perma.cc/7C76-AYE4. BOEM does not currently account for climate change effects in its analysis, and does not quantify environmental and social costs.

[112] *Id.*

[113] *See id.*

[114] For more information on how BLM and BOEM could quantify environmental and social option value, *see* Inst. for Policy Integrity, Comments on the 2019-2024 Outer Continental Shelf (OCS) Oil and Gas Leasing Draft Proposed Program 26-32 (Mar. 2018), https://perma.cc/U3BU-JSA3.

[115] *See supra* Part I.

[116] *See, e.g.*, *infra* Part V.B.

[117] *See infra*, Part V.B.

[118] *Id.*

[119] *See* 43 U.S.C. § 1701(a)(9); *supra* Part II.A.

[120] *See* Hein, *supra* note 6 at 33.

[121] *Supra* notes 63–64 and accompanying text.

[122] Jayni Foley Hein, *Harmonizing Preservation and Production*, Inst. for Policy Integrity, N.Y. Univ. Sch. of Law 15 (2015) [hereinafter Interior Leasing Report].

[123] *See supra* Part III.B.

[124] Hein, *Interior Leasing Report*, *supra* note 120, at 18.

[125] Hein, *Interior Leasing Report*, *supra* note 120, at 19.

[126] *See* 43 C.F.R. § 3103.2-2(a)-(b).

[127] Bureau of Land Management, Appendix 7—Lease Stipulations and Standard Lease Terms (BLM Form 3100-11), at A7-1¬–A7-2, https://perma.cc/L5YH-2PUP.

[128] *Id.*

[129] *See* 43 C.F.R. §§ 3101.1-2; 3101.1-3.

[130] 43 C.F.R. § 3107.2-1.

[131] 43 C.F.R. § 3135.1-6(a).

[132] 43 C.F.R. § 3135.1-6(b).

[133] 43 C.F.R. § 3103.4-4(b).

[134] *See* U.S. Gov't Accountability Office, GAO-18-411, Oil and Gas Lease Management: BLM Could Improve Oversight of Lease Suspensions with Better Data and Monitoring Procedures 1 (2018) [hereinafter GAO, Lease Management Report].

[135] *Id.* at 7, citing 43 C.F.R. § 3103.4-4. BLM officials told GAO that suspensions of production are rare. *Id.*

[136] *Id.* at 11, citing U.S. Dep't of the Interior, Bureau of Land Mgmt., Suspensions of Operations and/or Production Manual. However, it is difficult to determine the most common reasons for lease suspensions because BLM does not require such reasons to be included in its database. Rather, such information is in the official lease files, many of which are in hard copy.

[137] 43 C.F.R. § 3135.1-5(b).

[138] GAO, Lease Management Report, *supra* note 132, at 2.

[139] *Id.* at 14–15, 18. Colorado, Montana, New Mexico, Utah, and Wyoming alone had more than 2,350 of the 2,750 suspended leases, amounting to more than 2.9 million acres of land. *Id.* at 15.

[140] *See* Letter from Joseph R. Balash, Assistant Sec'y, Land & Minerals Mgmt., U.S. Dep't of the Interior, to Frank Rusco, Dir., Nat. Res. & Env't, U.S. Gov't Accountability Office (May 22, 2018) (on file with author). BLM said it will also replace its current database technology to help create standardized reports for lease suspension data and to have data fields recording the reasons for the suspensions. *Id.*

[141] Niina Farrah, *BLM Halts Leases after Sage Grouse, Climate Legal Brawls*, EnergyWire (Nov. 14, 2019), https://perma.cc/V3PR-LTQH.

[142] *Id.*

[143] GAO, Lease Management Report, *supra* note 132, at 25–26. GAO determined that BLM's monitoring of lease suspensions did not constitute quality information as defined by the *Standards for Internal Control in the Federal Government*. *Id.* at 19 ("[Q]uality information may be defined as appropriate, current, complete, accurate, accessible, and provided on a timely basis.") (citing U.S. Gov't Accountability Office, GAO-14-704G, Standards for Internal Control in the Federal Government (2014)). For example, the lack of a data field for lease suspensions prevents the public and others across the agency from knowing the reasons for or the status of such suspensions. Also, the system's informality can lead to inconsistent oversight and practices among field offices. *Id.* at 20–21. In addition to recommending a data field for BLM to record reasons for suspensions and official agency procedures for monitoring suspensions, GAO recommended that officials in headquarters and state offices oversee field offices' monitoring of suspensions, and recommended mechanisms to assist officials in such oversight (such as requiring standardized summary reports on lease suspensions). *Id.*

[144] *See infra* Part V.B.

[145] Whether President Trump will ultimately succeed in removing the land from the monument is currently subject to litigation. *See Wilderness Society v. Trump*, Case 1:17-cv-02587-TSC (D. D.C. 2019).

[146] U.S. Dep't of the Interior, Bureau of Land Mgmt., Grand Staircase-Escalante National Monument and Kanab-Escalante Planning Area Proposed Resource Management Plans and Final Environmental Impact Statement ES-39 (Oct. 2019), https://perma.cc/JSV9-2HFT [hereinafter KEPA RMP & Final EIS].

[147] *Id.* at ES-39.

[148] *Id.* at ES-7.

[149] *Id.* at 2-15.

[150] *Id.* at ES–27. In any event, job and labor income projections are usually transfers from one group to another, and not reflective of net welfare gains.

[151] Michael Vanden Berg, Utah Geological Survey, Mineral Potential Report for the Lands Now Excluded from Grand Staircase-Escalante National Monument 58 (2018), https://perma.cc/PHX7-TTF3.

[152] *Id.*

[153] U.S. Dep't of the Interior, *Explore Data/Utah*, https://perma.cc/W74Q-SZFC; *see also* Juliet Eilperin, *A Diminished Monument*, Wash. Post (Jan. 15, 2019), https://perma.cc/N8NQ-CX2Q.

[154] Eilperin, *supra* note 151. Another source cites two dozen types of dinosaurs discovered at the monument. Ben Arnoldy, *Monumental Discoveries*, Earthjustice (July 2, 2018), https://perma.cc/Q33W-WM75.

[155] KEPA Proposed RMP & Final EIS, *supra* note 144, at ES–16.

[156] Letter from Soc'y of Vertebrate Paleontology to U.S. Bureau of Land Mgmt. at 10 (on file with author) [hereinafter SVP Letter].

[157] *Id.* at 3.

[158] Eilperin, *supra* note 151. On the one hand, paleontologist Alan Titus, who works within the monument, said casual fossil collection will not deplete fossils that are important to research. On the other hand, Jeff Eaton, a retired professor, is concerned about what will be taken out of the monument. *Id.*

[159] KEPA Proposed RMP & Final EIS, *supra* note 144, at ES–16.

[160] For a study of the importance of bees as primary pollinators of most flowering plants, *see* Jeff Ollerton et al., *How Many Flowering Plants Are Pollinated by Animals?*, 120 Oikos 321, 321 (2011) ("Plant–pollinator relationships may be one of the most ecologically important classes of animal–plant interaction: without pollinators . . . many animal populations would decline, with consequent knock-on effects for other species.").

[161] Olivia Messinger Carril et al., *Wild Bees of Grand Staircase-Escalante National Monument: Richness, Abundance, and Spatio-Temporal Beta-Diversity*, PeerJ DOI 10.7717/peerj.5867 (2018), citing Jason Gibbs et al., *The Bees of Michigan (Hymenoptera: Apoidea: Anthophila)*, 4352 Zootaxa 1 (2017).

[162] *Id.* at 2.

[163] *Id.* at 16.

[164] *See, e.g.*, Ollerton et al., *supra* note 158, at 321 (citing human reliance on animal-pollinated crops but lack of scientific consensus on how many pollinated flowering plant species exist); Elizabeth Grossman, *Declining Bee Populations Pose a Threat to Global Agriculture*, Yale Env't 360 (Apr. 30, 2013), https://perma.cc/8ZHS-WVSP ("One of every three bites of food eaten worldwide depends on pollinators, especially bees, for a successful harvest . . ."); U.S. Envtl. Prot. Agency, *Pollinator Protection: Colony Collapse Disorder*, https://perma.cc/RYR3-YP53 (summarizing the Colony Collapse Disorder Action Plan created for bee protection in 2007). *But see* Jon Entine, *The Bee Apocalypse Was Never Real; Here's Why*, American Council on Science & Health (Apr. 17, 2018) https://perma.cc/Q5AW-5CKJ (discussing the myth of honeybee decline).

[165] *See* KEPA Proposed RMP & Final EIS, *supra* note 132.

[166] *Supra* Part IV.A.

[167] U.S. Dep't. of the Interior, *USGS Identifies Largest Continuous Oil and Gas Resource Potential Ever Assessed*, https://perma.cc/H8PQ-87XZ. At current production rates, the Basin is said to produce as much as 49 years' worth of oil. Jennifer Hiller, *Texas and New Mexico Shale Basins Hold 49 Years Worth of Oil: USGS*, Reuters (Dec. 6, 2018) https://www.reuters.com/article/us-oil-shale-texas/texas-and-new-mexico-shale-basins-hold-49-years-worth-of-oil-usgs-idUSKBN1O52IV.

[168] Keith Schneider, *Here's Why New Mexico's Oil Boom Is Raising a Lot of Questions About Water*, L.A. Times (Mar. 25, 2018), https://perma.cc/P477-LQLA ("Conditions here are unique," said Ed Martin, assistant commissioner in the New Mexico State Land Office, which manages nearly 2 million acres of state land for energy production. "The volumes of water the industry uses are so prolific. The disposal problems are more pronounced. The potential for something to go wrong is higher.").

[169] Rachel Leven, *Drilling Overwhelms Agency Protecting America's Lands*, Ctr. for Pub. Integrity (Nov. 13, 2018), https://perma.cc/L8A5-EQQ3.

[170] Nat'l Park Serv., *Beauty and Wonder; Above and Below*, https://perma.cc/3ZA7-76ED; *see also* Schneider, *supra* note 166.

[171] BLM, Draft Resource Management Plan and Environmental Impact Statement (Aug. 2018), https://perma.cc/SD34-2H6R; Leven, *supra* note 167.

[172] Bonnie Berkowitz & Adrian Blanco, *Mapping the Strain on our Water*, Wash. Post (Aug. 6, 2019) https://www.washingtonpost.com/climate-environment/2019/08/06/mapping-strain-our-water/?arc404=true.

[173] Schneider, *supra* note 166.

[174] *Id.*

[175] Though this report focuses on the particularly uncertain effects of fracking on groundwater in New Mexico, see an account of the ramifications on Texas groundwater from fracking in the Basin in Christopher Collins, *In the Heart of the West Texas Oil Patch, A New Fracking Frenzy Is Putting a Strain on Groundwater*, Tex. Observer (Dec. 11, 2017), https://perma.cc/RM6P-AU9E.

[176] Schneider, *supra* note 166.

[177] *See* U.S. Dep't of the Interior, Bureau of Land Mgmt., September 2018 Competitive Oil and Gas Lease Sale 13 (2018), https://perma.cc/VP2J-3LN5. No Environmental Impact Statement was prepared for the September 2018 lease sale because Alternative B deferred parcels thought to be connected to the Capitan Aquifer. U.S. Dep't of the Interior, Bureau of Land Mgmt., September 2018 Competitive Oil and Gas Lease Sale DOI-BLM-NM-P000-2018-0004-EA—Finding of No Significant Impact (2018), https://perma.cc/5Z5Z-SXMV.

[178] Jeb French, *Legislature Approves Funding to Stabilize Sinkhole-in-Waiting*, KOB4 (Feb. 12, 2018, 9:52 PM) https://perma.cc/5SV7-Q93J.

[179] Associated Press, *Project to Fill Defunct Brine Well Faces $9M Shortfall*, AP News (Oct. 29, 2019), https://perma.cc/MUL2-NM76.

[180] *See* Schneider, *supra* note 166 (quoting George Veni, director of the National Cave and Karst Research Institute).

[181] Lewis Land, Evaporite Karst in the Permian Basin Region of West Texas and Southeastern New Mexico: The Human Impact, Nat'l Cave & Karst Res. Inst. (2013) (detailing the scientific causes of the 2008 sinkholes in the Carlsbad region); *see also* Schneider, *supra* note 166.

[182] Kevin Crowley, *The Permian Oil Boom Is Showing Signs of Overheating*, Bloomberg (Oct. 16, 2018), https://perma.cc/T4BZ-D28P.

[183] Laura B. Comay et al., Cong. Res. Serv., Arctic National Wildlife Refuge (ANWR): An Overview 9 (2018), https://perma.cc/UNW9-FYK9.

[184] *Id.* at 10. Each sale must offer at least 400,000 acres and must include high-potential areas for discovery of hydrocarbons. *Id.*

[185] *Id.* at 4; Steven Amstrup, *Arctic National Wildlife Refuge*, Polar Bears Int'l (Dec. 13, 2017), https://perma.cc/Q677-3JR5.

[186] U.S. Fish & Wildlife Serv., *Wildlife & Habita*t, https://perma.cc/FU4D-HLP2.

[187] Amstrup, *supra* note 183; George M. Durner, Steven C. Amstrup, & Ken J. Ambrosius, *Polar Bear Maternal Den Habitat in the Arctic National Wildlife Refuge*, Alaska, 59 Arctic 31, 34 (2006); *see also* A.S. Fischbach et al., *Landward and Eastward Shift of Alaskan Polar Bears Denning Associated With Recent Sea Ice Changes*, 30 Polar Biol 1395 (2007). Part of an international agreement in 1973 among the U.S., Canada, Denmark, Norway, and the former Union of Soviet Socialist Republics mandated parties to give "special attention to habitat components such as denning and feeding sites . . ." of polar bears. Pamela Baldwin, Cong. Res. Serv., Legal Issues Related to Proposed Drilling for Oil and Gas in the Arctic National Wildlife Refuse (ANWR) 12 (2004) (quoting Agreement on the Conservation of Polar Bears, T.I.A.S. No. 8409, 27 U.S.T. 3918 (Nov. 15, 1973)).

[188] U.S. Fish & Wildlife Serv., *Bears*, https://perma.cc/N64L-T6P6.

[189] Fischbach et al., *supra* note 185.

[190] Polar bears were listed as threatened under the Endangered Species Act in 2008. Comay, *supra* note 181, at 18.

[191] *Id.* at 4.

[192] Henry Fountain, *Tests for Oil in Arctic Refuge Won't Happen This Winter, Officials Say*, N.Y. Times (Feb. 7, 2019), https://www.nytimes.com/2019/02/07/climate/seismic-testing-anwr-alaska.html.

[193] Henry Fountain, *Here's What Oil Drilling Looks Like in the Arctic Refuge, 30 Years Later*, N.Y. Times (Dec. 15, 2017), https://www.nytimes.com/2017/12/15/climate/arctic-drilling-anwr.html?module=inline ("Once you start disturbing the tundra vegetation, it takes sometimes nearly forever for the mark to go away.").

[194] *Seismic Trails*, U.S. Fish & Wildlife Serv., https://perma.cc/3HUR-63B7.

[195] Henry Fountain, *Alaska's Permafrost Is Thawing*, N.Y. Times (Aug. 23, 2017) https://www.nytimes.com/interactive/2017/08/23/climate/alaska-permafrost-thawing.html?module=inline, citing Andrew H. MacDougall et al., *Significant Contribution to Climate Warming From the Permafrost Carbon Feedback*, 5 Nature Geoscience 719 (2012), https://www.nature.com/articles/ngeo1573.pdf.

[196] Craig Welch, *Arctic Permafrost is Thawing Fast. That Affects Us All*, Nat'l Geographic (Sept. 2019), https://www.nationalgeographic.com/environment/2019/08/arctic-permafrost-is-thawing-it-could-speed-up-climate-change-feature/#close ("We know there are thresholds we don't want to cross," said Chris Field, director of Stanford University's Woods Institute for the Environment. "But we don't know precisely where they are.").

[197] Alaska Wilderness League, "People of the Arctic National Wildlife Refuge," https://www.alaskawild.org/wp-content/uploads/2014/10/People-of-the-Arctic-National-Wildlife-Refuge.pdf.

[198] *Id.*

[199] Steven Mufson, *Trump Administration Takes Another Step Toward Oil Drilling in Arctic National Wildlife Refuge*, Wash. Post (Dec. 20, 2018), https://www.washingtonpost.com/national/health-science/trump-administration-takes-another-step-toward-oil-drilling-in-arctic-national-wildlife-refuge/2018/12/20/5fb93f40-0469-11e9-b5df-5d3874f1ac36_story.html?noredirect=on&utm_term=.651aae8cb466.

[200] Lee-Ashley & Rowland-Shea, *supra* note 8; *see also* Comay, *supra* note 181, at 1.

[201] Lee-Ashley & Rowland-Shea, *supra* note 8.

[202] This figure does not include the costs of pulling out of the project, which could cost up to $4.1 billion. Karolin Schaps, *Royal Dutch Shell Pulls Plug on Arctic Exploration*, Reuters (Sept. 28, 2015, 1:48 AM), https://www.reuters.com/article/us-shell-alaska/royal-dutch-shell-pulls-plug-on-arctic-exploration-idUSKCN0RS0EX20150928.

[203] Comay, *supra* note 181, at 3.

[204] *Id.* at 12.

[205] *Id.* at 13–14.

[206] *See* Adam Federman, *How Science Got Trampled in the Rush to Drill in the Arctic*, Politico (July 26, 2019), https://perma.cc/5N3F-RZ5E (stating, "Geoff Haskett, who served as regional director for the Alaska Region of the Fish and Wildlife Service during the Obama administration, said the rush to lease has undermined the scientific integrity of the review process.").

[207] The leases in the 130,000-acre area were suspended since the 1980s. *Interior Department Cancels Remaining Oil and Gas Leases in Montana's Badger-Two Medicine Area*, U.S. Dep't of the Interior, Bureau of Land Mgmt. (Jan. 10, 2017), https://perma.cc/PHB3-FKUU [hereinafter BLM Jan. 10, 2017 Press Release].

[208] All leaseholders were refunded for any lease payments. In 2016, the Department of the Interior cancelled its remaining leases with Solenex LLC and Devon Energy, who voluntarily relinquished its never-developed leases and was refunded about $200,000. *Secretary Jewell, Senator Tester, Blackfeet Nation, and Devon Energy Announce Cancellation of Oil and Gas Leases in Montana's Lewis and Clark National Forest*, U.S. Dep't of the Interior (Nov. 16, 2016), https://perma.cc/DTZ6-LRP9 [hereinafter DOI Nov. 16, 2016 Press Release]. DOI cancelled its leases with the J.G. Kluthe Trust of Nebraska and W.A. Moncrief, Jr. of Texas in 2017. BLM Jan. 10, 2017 Press Release, *supra* note 205.

[209] *See* DOI Nov. 16, 2016 Press Release, *supra* note 206; *The Badger-Two Medicine Is Too Wild to Drill*, Wilderness Soc'y, https://www.wilderness.org/wild-places/montana/oil-and-gas-drilling-badger-two-medicine.

[210] BLM Jan. 10, 2017 Press Release, *supra* note 192.

[211] Letter from Blackfeet Tribal Bus. Council to Sally Jewell, Sec'y, U.S. Dep't of the Interior & Tom Vilsack, Sec'y, U.S. Dep't of Agric. (Oct. 24, 2014) (on file with author) [hereinafter Blackfeet Tribal Bus. Council Letter].

[212] Dept. of Interior, *Interior Department Cancels Oil and Gas Lease in the Lewis and Clark National Forest* (Mar. 17, 2016), https://perma.cc/L52Q-FAU8.

[213] Tristan Scott, *Judge Hears Final Arguments in Badger-Two Medicine Case*, Flathead Beacon (Mar. 19, 2018), https://perma.cc/649H-UAT6.

[214] Kianna Gardner, *Moncrief Permanently Retires Lease in Badger-Two Med*, Daily Inter Lake (Oct. 1, 2019), https://www.dailyinterlake.com/breaking_news/20191001/moncrief_permanently_retires_lease_in_badger-two_med.

[215] *Moncrief v. U.S. Dep't of the Interior*, No. 17-609, slip op. at 13–14 (D.D.C. Sept. 24, 2018) (finding that Moncrief was not given sufficient notice that their leases might be subject to cancellation and that his rights as a *bona fide* purchaser were violated under MLA); *Solenex L.L.C. v. Jewell*, No. 13-0993 (RJL), slip op. at 13–15 (D.D.C. Sept. 24, 2018) ("[T]his "wait and see" approach—though convenient from a policy perspective—wreaks havoc on the interests of individual landholders.).

[216] *Badger Two-Medicine*, Mont. Wilderness Ass'n, https://perma.cc/NMN4-CFM9.

[217] *See supra* note 213 and accompanying text.

[218] *See Solonex*, slip op. at 13–14 (citing *Prieto v. United States*, 655 F. Supp. 1187, 1191 (D.D.C. 1987) (finding the agency's rescission of trust status to an Indian land grant after nine months was arbitrary and capricious) and *Am. Wild Horse Pres. Campaign v. Perdue*, 873 F.3d 914, 923 (D.C. Cir. 2017) ("A central principle of administrative law is that, when an agency decides to depart from decades-long past practices and official policies, the agency must at minimum acknowledge the change and offer a reasoned explanation for it.")).

[219] *See supra* Part IV.B.2.

[220] *See Solenex*, slip op. at 7, 12–13; *see also supra* Part IV.B.

[221] Complaint at 1, Wilderness Soc'y v. Zinke, No. 1:18-cv-01496 (D.D.C. June 25, 2018) at 7–8 [hereinafter Wilderness Soc'y Complaint].

[222] Pat Pheifer, *Interior Department Reinstates Leases for Twin Metals Minnesota Mine Project*, Star Tribune (May 3, 2018, 5:43 AM), https://perma.cc/SX6W-EJCW. Among other environmental concerns, the Area is a critical habitat for many species, including three under the Endangered Species Act and over 100 species of migratory breeding birds. U.S. Fish & Wildlife Serv., *Minnesota: County Distribution of Federally-listed Threatened, Endangered, Proposed, and Candidate Species*, https://perma.cc/SHJ6-ZBYF. For a summary of the Area's ecological value, *see* John L. Weaver, Wildlife Conservation Soc'y, Conservation Value of Roadless Areas for Vulnerable Fish and Wildlife Species in the Crown of the Continent Ecosystem, Montana (2011).

[223] Wilderness Soc'y Complaint, *supra* note 219; *see also* Pheifer, *supra* note 220.

[224] The U.S. Departments of Agriculture and the Interior received opposition letters from 170 businesses and outdoors organizations by the end of May. *Lawsuit Aims to Prevent Mining Pollution near Boundary Waters Wilderness in Minnesota*, Earthjustice (June 25, 2018), https://perma.cc/9TMS-USGV.

[225] The first was brought by nine Minnesota business that sought to protect the recreation area from mining, challenging the reinstatement of the leases as "arbitrary and capricious." Complaint at 3, Voyageur Outward Bound Sch. v. United States, No. 1:18-cv-01463-NNM (D.D.C. June 21, 2018). The second, brought by the Wilderness Society, the Izaak Walton League of America, and the Center for Biological Diversity, challenged BLM's reinstating the leases as beyond BLM's authority and arbitrary. Wilderness Soc'y Complaint, *supra* note 206, at 1.

[226] Letter from Thomas L. Tidwell, Chief, U.S. Dep't of Agric. Forest Serv. to Neil Kornze, Dir., U.S. Dep't of the Interior Bureau of Land Mgmt. (Dec. 14, 2016) [hereinafter Tidwell Letter] (on file with author); Pheifer, *supra* note 207.

[227] Tidwell Letter, *supra* note 224 ("In addition to the existing high quality of the waters, the dramatic hydrogeology and interconnectedness of BWCAW's [Boundary Waters Canoe Area Watershed] forests, lakes, streams, and wetlands make the region unique and susceptible to degradation.").

[228] *Twin Metals*, Sierra Club, https://perma.cc/ZF4V-JHQ7 (last visited Nov. 29, 2019) ("Although mining companies claim that they can "mitigate" such problems, there is currently no sulfide mine in existence that is not polluting the ground[sic]water.").

[229] U.S. Dep't of the Interior, Bureau of Land Mgmt., Environmental Assessment 13–14 (2018), https://perma.cc/R257-U353 [hereinafter Twin Metals EA].

[230] Sierra Club, *supra* note 226.

[231] *Creating Local Jobs*, Twin Metals Minn., https://perma.cc/R4ER-B3MQ.

[232] Tidwell Letter, *supra* note 211, at 5.

[233] *Id.*

[234] *See, e.g.*, *Create Your Own Adventure in the Boundary Waters*, Explore Minn., https://www.exploreminnesota.com/travel-ideas/create-your-adventure-in-the-boundary-waters/.

[235] Twin Metals EA, *supra* note 227, at 6, 9. Regarding general resource protection, BLM requires "exercise reasonable diligence to protect life, health, property, mineral or water resources." BLM said this requirement more expressly seeks to protect habitats than the No-Action Alternative, but still does not anticipate any measurable difference in impact to wildlife habitats. BLM also does not expect any measurable difference between the two Actions when it comes to watershed protection because both require compliance with state and federal laws. Overall, BLM believes the Proposed Action only "may have a slightly more beneficial effect on shared resources . . ." *Id.* at 24.

[236] *Supra* Part IV.B.2.

[237] United Nations Educ., Sci. & Cultural Org. World Heritage Convention, *Chaco Culture*, https://perma.cc/EFV2-3D6V.

[238] Nat'l Park Serv., *History & Culture*, https://perma.cc/SUY8-3LCS.

[239] United Nations Educ., Sci. & Cultural Org. World Heritage Convention, *supra* note 235.

[240] Nat'l Park Serv., *Chaco Night Sky Program*, https://perma.cc/Y9EW-S6FY.

[241] Nat'l Park Serv., *History & Culture*, *supra* note 236; Adam Markham, *Chaco Canyon at Risk: Interior Nominee Bernhardt Wants to Drill on Lands Sacred to Tribes*, Union of Concerned Scientists (Feb. 19, 2019), https://perma.cc/W7YY-TH5M. Senators Tom Udall and Martin Heinrich introduced the Chaco Cultural Heritage Area Protection Act in May 2018 to ban drilling and fracking on lands within a 10-mile radius of the Park, part of which BLM offered for lease in February 2019. Chaco Cultural Heritage Area Protection Act, S. 2907, 115th Cong. (2018), https://perma.cc/3J72-WA62.

[242] Michael Coleman, *Zinke Cancels Chaco Canyon Lease Sale*, Albuquerque J. (Mar. 1, 2018), https://perma.cc/MVP2-GXAW.

[243] *Id.*

[244] Rebecca Moss, *BLM Defers Sale of Oil, Gas Leases in Chaco Canyon Area*, Santa Fe New Mexican (Feb. 8, 2019), https://perma.cc/88XR-UERV.

[245] *Id.*

[246] Letter from Susan M. Chandler, RPA, President, Soc'y for American Archaeology to Tim Spisak, State Dir., BLM New Mexico State Office (Feb. 15, 2019), https://perma.cc/5FJK-8JXM.

[247] Nat'l Parks Conservation Ass'n, *BLM Defers Oil and Gas Lease Sales in New Mexico, Temporarily Protecting Chaco Culture National Historical Park* (Feb. 8, 2019), https://perma.cc/L3VY-GBK2. The representative also stated that all remaining lease sales be deferred until both the Resource Management Plan is updated and the tribes are consulted.

[248] Adam Markham, *Chaco Canyon at Risk*, Union of Concerned Scientists Blog (Feb. 19, 2019), https://perma.cc/53D5-FVMS.

[249] Heather Richards, *Chaco Oil and Gas Ban Falls Short for Some Locals*, GreenWire (May 31, 2019), https://perma.cc/9TBV-MFB6.

[250] H.R.2181, Chaco Cultural Heritage Area Protection Act of 2019.

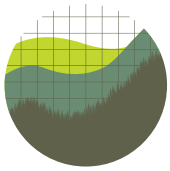

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Exhibit 4:

America's Public Lands Giveaway; Oil and gas companies are paying bargain rates to acquire and sit on millions of acres.

Center for Western Priorities and The Wilderness Society.

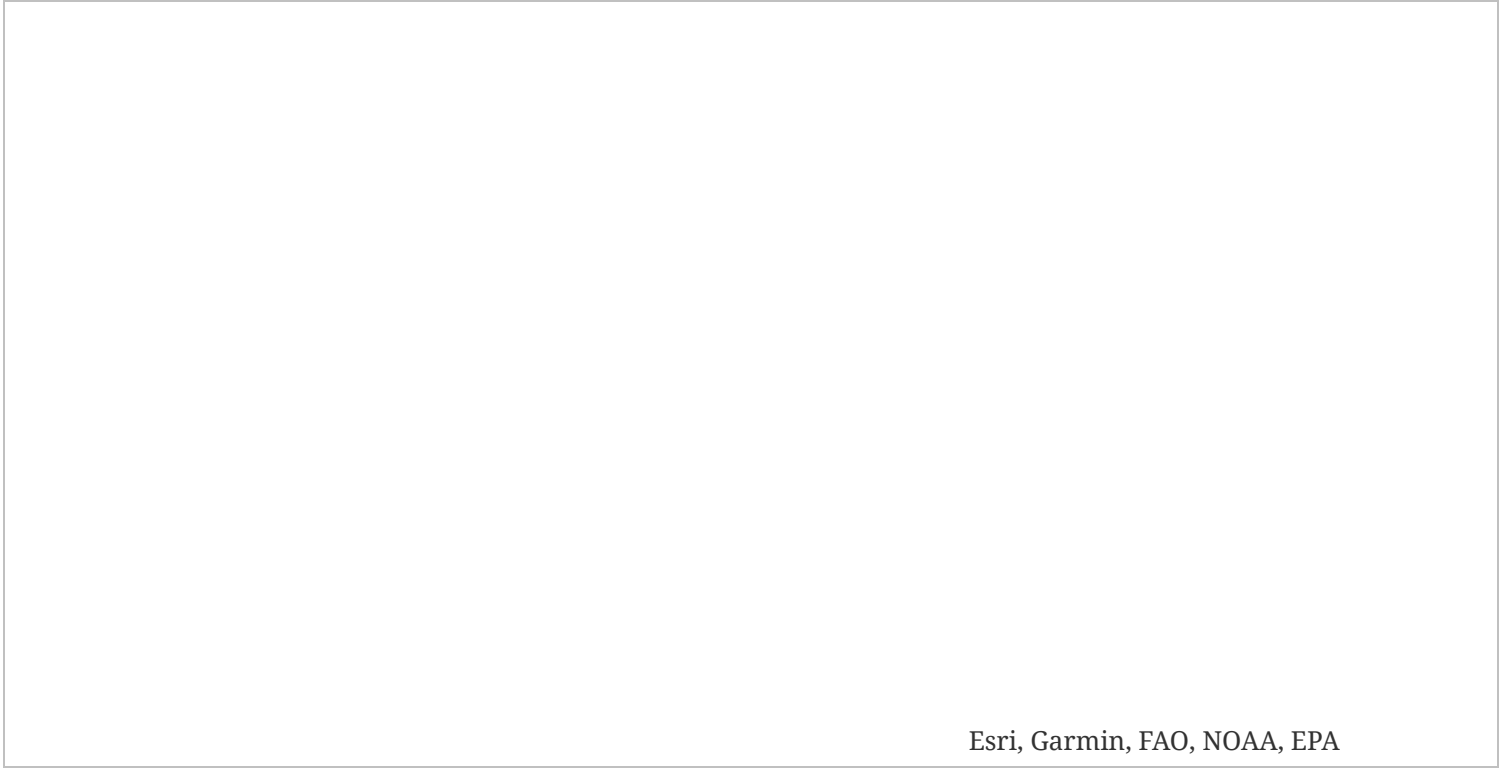
Across the American West, millions of acres of public lands are currently leased for oil and gas drilling. For decades, private companies have taken advantage of an outdated system that is tilted in favor of the oil and gas industry and against taxpayers. These oil and gas companies drive the process to lease the public's land, pay extremely low bid rates, and leave millions of idle leased acres off limits to other uses.

While this is happening, the general public is often left in the dark. The federal government's system for tracking key oil and gas development information on public lands is inadequate and onerous. **The Wilderness Society and the Center for Western Priorities conducted a first-of-its-kind geospatial analysis to shine a light on the outdated leasing process. Using a newly developed tool, the analysis mapped all federal oil and gas leases, identifying instances where public lands leases were sold for bargain prices.**

Oil and gas leases currently lock up 17.7 million acres of public lands across ten Western states—Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, and Wyoming. These leases are often purchased at sweetheart prices as part of an outdated federal leasing process. **According to our analysis, 32 percent of all public lands and minerals actively leased for oil and gas were sold for just $2.00 per acre or less—totaling 5.7 million acres.**

Public lands leased for oil and gas development

As of August 2019, the oil and gas industry is leasing 17.7 million acres of national public lands in the West.



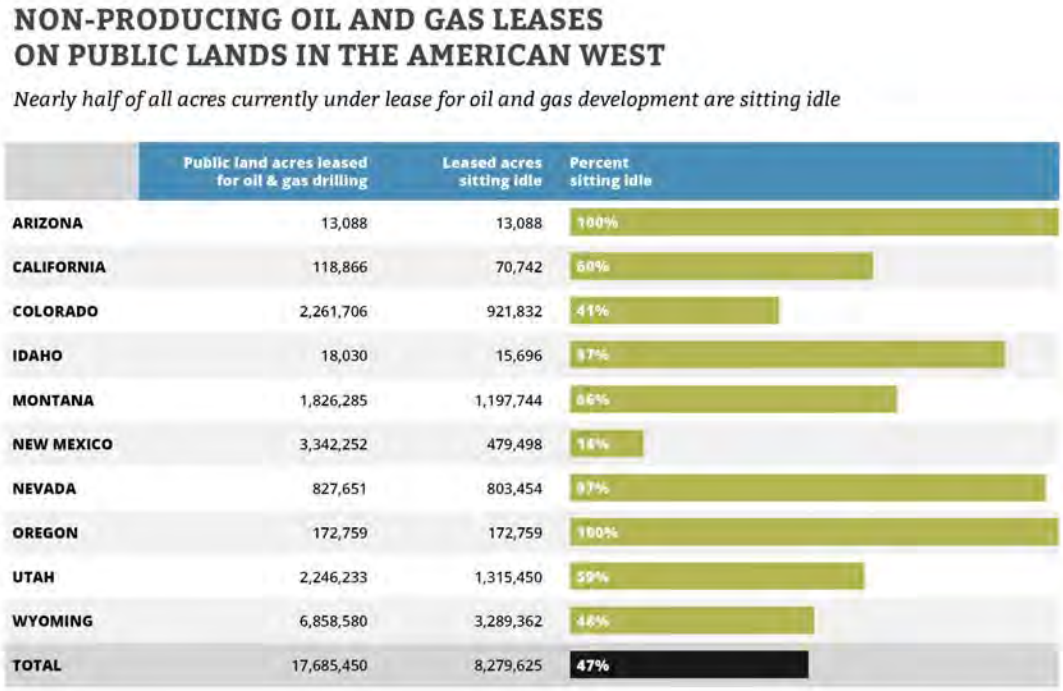
Such low cost leases shortchange taxpayers and incentivize speculation on public lands with little or no potential for oil and gas development. Compared to leases that sold for more than $2.00 per acre, low cost leases have significantly higher rates of termination. **Since 1987, when Congress passed the last major amendment (link: https://www.congress.gov/bill/100th-congress/house-bill/2851) to the Mineral Leasing Act, 60 percent of all acres leased—covering 42.1 million acres—have been leased for $2.00 or less. More than 90 percent of those leases are no longer active.**

LOW COST OIL AND GAS LEASING ON PUBLIC LANDS IN THE AMERICAN WEST

Leases sold for $2.00 per acres or less make up 32 percent of all lands currently under lease for oil and gas development

	Acres leased for oil & gas drilling	Acres leased for the minimum bid ($2.00/acre bid)	Acres leased noncompetitively (No bid, $1.50/acre rental)	Percent leased for $2.00 or less
ARIZONA	13,088	3,040	1,161	32%
CALIFORNIA	118,866	10,250	19,115	25%
COLORADO	2,261,706	263,757	459,118	32%
IDAHO	18,030	4,372	0	24%
MONTANA	1,826,258	112,996	933,110	57%
NEW MEXICO	3,342,252	27,824	931,884	29%
NEVADA	827,651	114,339	526,178	77%
OREGON	172,759	149,333	0	86%
UTAH	2,246,233	199,713	637,998	37%
WYOMING	6,858,580	468,619	823,588	19%
TOTAL	17,685,450	1,354,243	4,352,054	32%

Royalties from energy development are an important source of revenue for Western states and American taxpayers, but oil and gas companies frequently sit on undeveloped public land leases with little consequence. **According to the analysis, nearly half (47 percent) of all actively leased acres are currently sitting idle, generating only $1.50 per acre for taxpayers annually and preventing those lands from being actively managed (link: https://www.americanprogress.org/issues/green/reports/2019/05/23/470140/backroom-deals/) for conservation and recreation.**



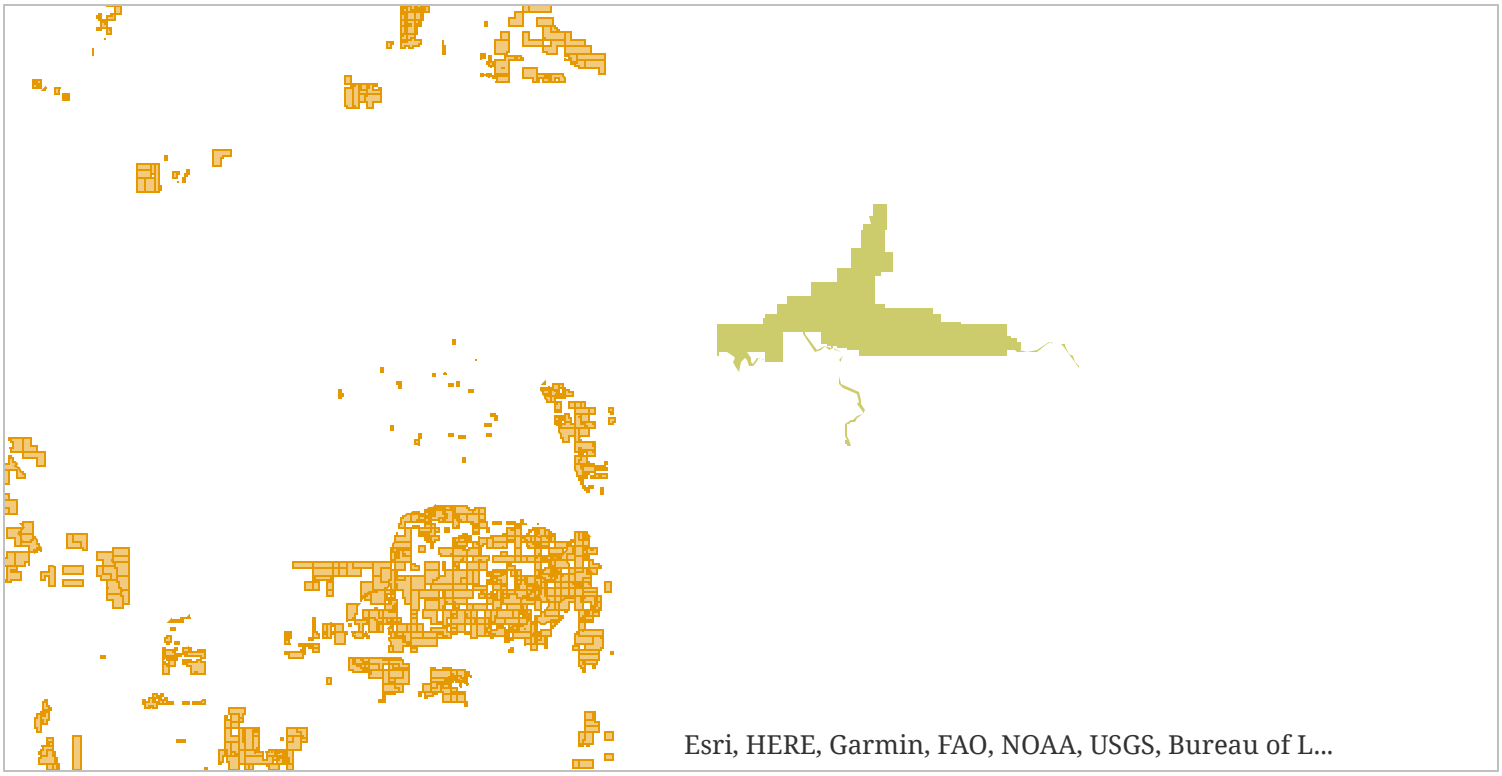
While 90 percent of public lands managed by the Bureau of Land Management (BLM) are available for oil and gas development (link: https://www.wilderness.org/articles/article/open-business-and-not-much-else-analysis-shows-oil-and-gas-leasing-out-whack-blm-lands) , only 10 percent are prioritized for other uses, like outdoor recreation, wildlife management, and conservation. Since 2017, the Trump administration has offered over 18.7 million acres (link: https://docs.google.com/spreadsheets/d/1WOA-Kr0nHE2KzsnCeI8SFNs9a0Rzz8GB9448lkjwkuE/edit#gid=344014728) nationwide to the oil and gas industry at auction. Simultaneously, this administration has eliminated protections for more than 13.5 million acres of public lands (link: https://www.americanprogress.org/issues/green/news/2019/03/20/467548/13-5-million-acre-lie/) once protected by mineral withdrawals or as national monuments.

The industry's footprint is excessive, locking up public lands and encroaching on national parks, imperiled wildlife habitat, and critical migration corridors.

The following series of maps takes a closer look at iconic landscapes under pressure from development, before taking a deeper dive into the current leasing system—a wildly outdated process that caters to the oil and gas industry at every step of the way.

Dinosaur National Monument

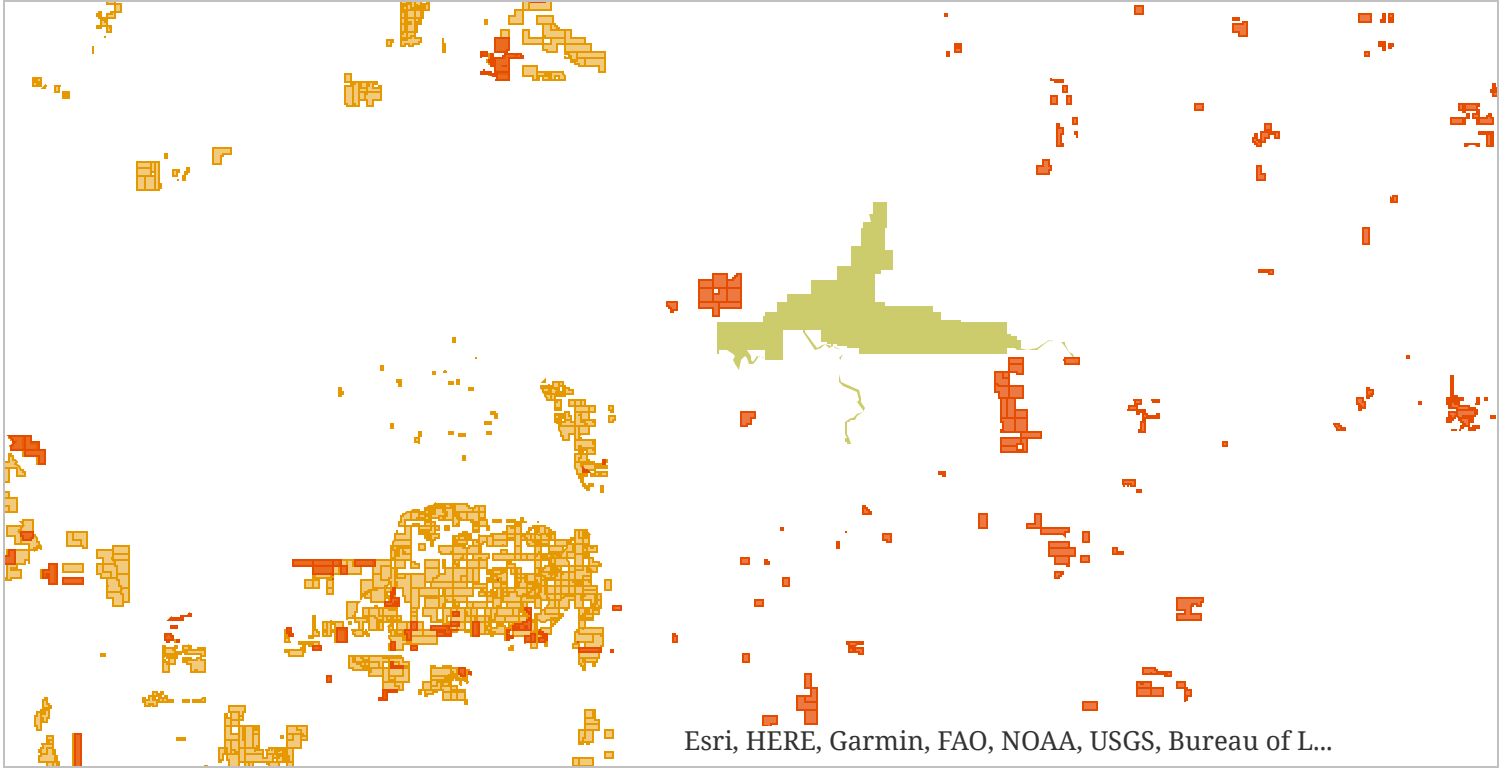
On the border between Colorado and Utah, oil and gas development directly abuts Dinosaur National Monument where incredible dinosaur fossils are still visible in the rocks.



A number of the leases in the park's vicinity were leased for the ***minimum bid*** of just **$2.00 per acre**.

Federal oil and gas leases

Federal oil and gas leases leased for minimum bid

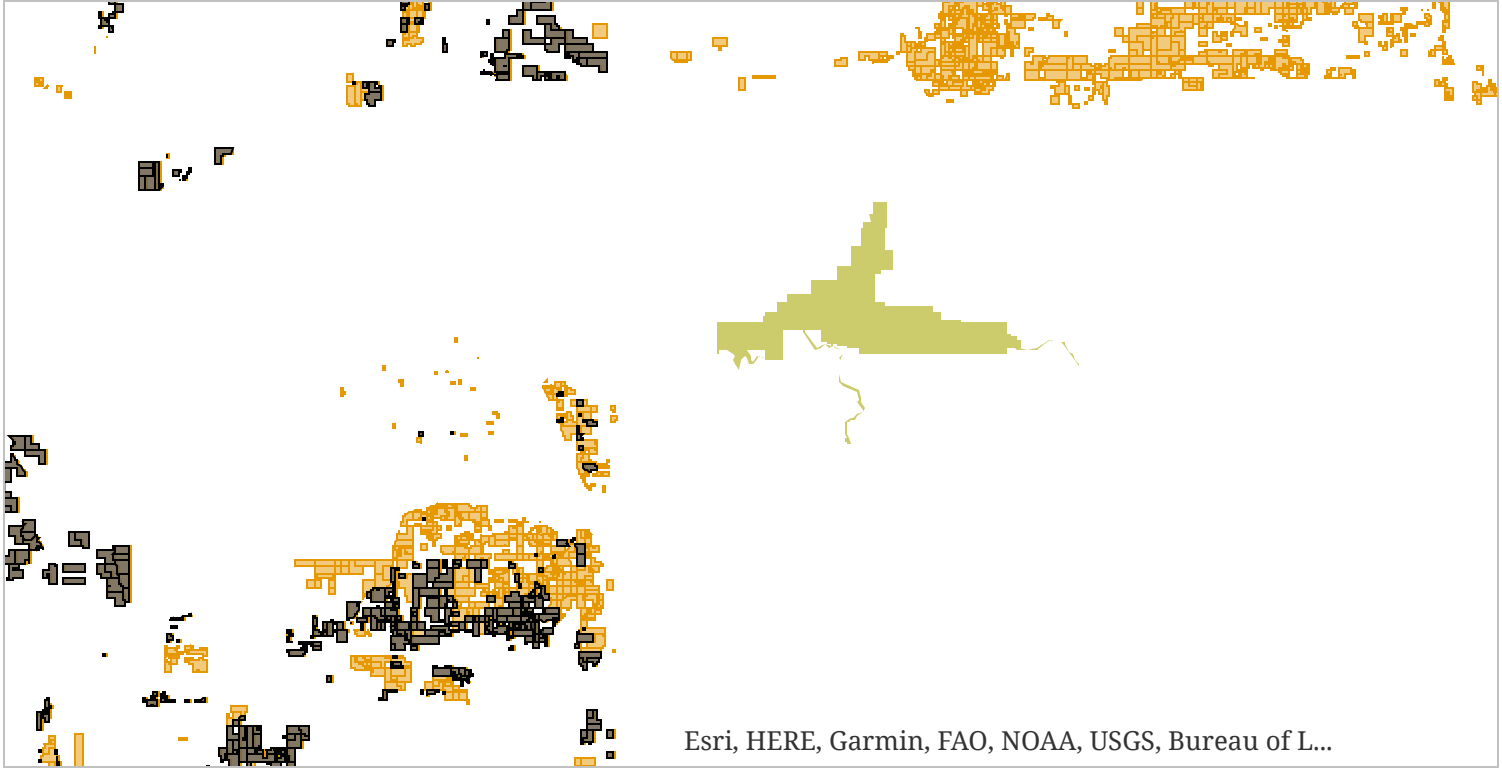


An even greater number of nearby leases were leased noncompetitively. If an oil and gas lease fails to sell at auction, it's available for sale for two years. Interested oil and gas companies only have to pay the first year's rental rate of **$1.50 per acre** and a small administrative fee.

Federal oil and gas leases

Federal oil and gas leases leased for minimum bid

Federal oil and gas leases leased noncompetitively



All of the leases directly adjacent to Dinosaur are currently sitting idle. Each year, oil and gas companies tie up public lands next door to the park, paying only a small rental fee—**$1.50 per acre**.

Dinosaur National Monument

Federal oil and gas leases

Federal oil and gas leases sitting idle

Sage-grouse habitat

Across the West, development is squeezing wildlife into smaller, more fragmented pockets of land and threatening populations of once-prolific species. The sage-grouse highlights this trend. The chicken-sized bird serves as an “indicator species," predicting the health of other plant and animal species across the Western sagebrush ecosystem.

Development, particularly during recent oil and gas drilling booms, has caused populations of the bird to plummet by an estimated 30 percent since 1985 (link: https://www.hcn.org/articles/birds-more-plans-less-protections-for-sage-grouse) . After years of hard-fought negotiations, the Obama administration, Western governors from both political parties, ranchers, and conservationists agreed on a series of landmark plans that would protect the sage-grouse while still allowing for new development.

A key component of those sage-grouse plans involved protecting critical habitat to allow populations to rebound. Within the plans, priority habitat management areas were one of the most critical designations, identified by high sage-grouse population densities and large expanses of undisturbed public land, ideal for preserving breeding habitat and landscape connectivity.

However, the Trump administration has since significantly weakened the sage-grouse conservation plans to allow more oil and gas development. In their overhaul of the Obama-era plans, the administration reduced

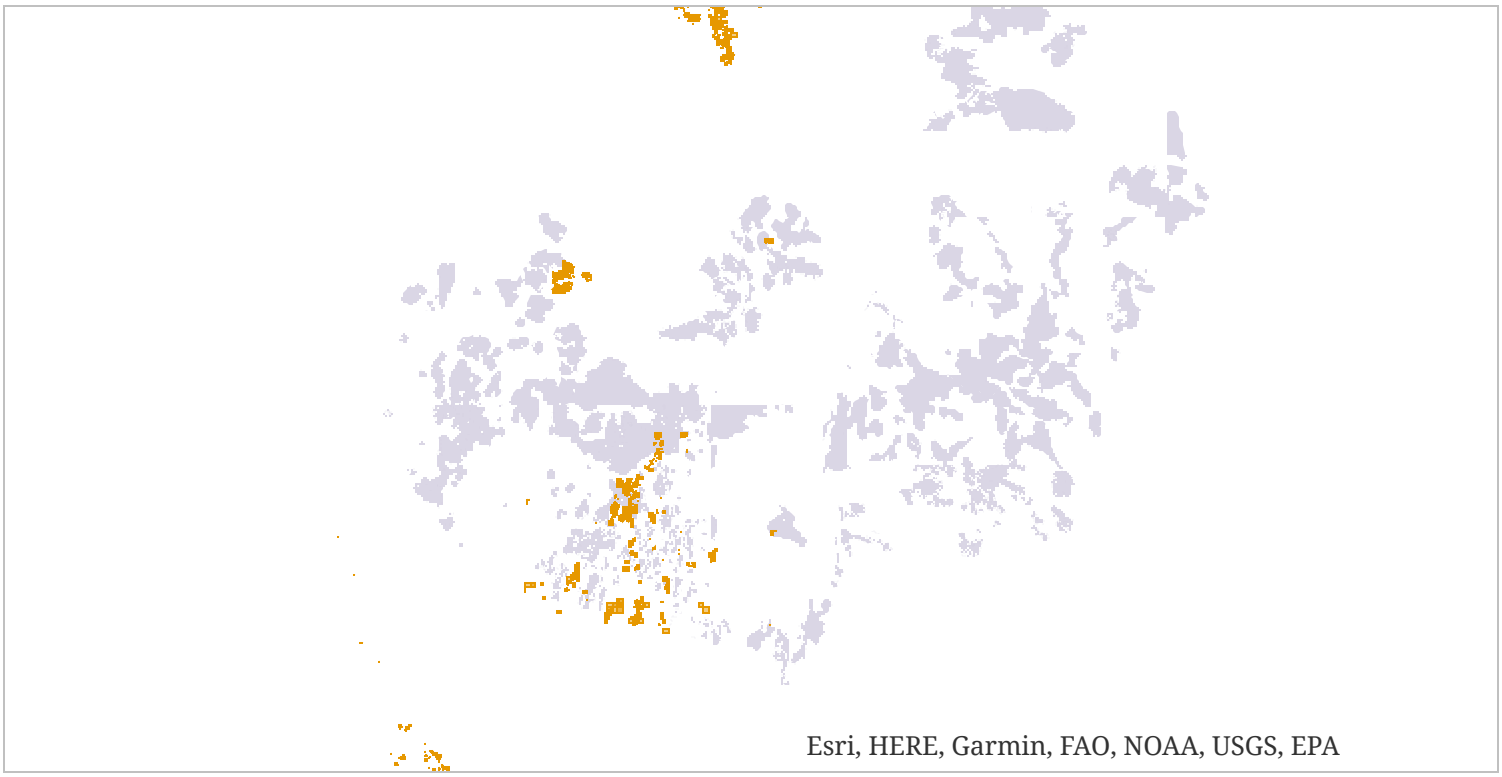
protections for nearly 9 million acres (link: https://www.nytimes.com/2018/12/06/climate/trump-sage-grouse-oil.html) and opened critical habitat to drilling.

Sage-Grouse Habitat

Today, the Interior Department is moving forward with oil and gas leasing in prime sage-grouse habitat across the West.

The 2015 sage-grouse plans established priority habitat management areas, large expanses of undisturbed public land, ideal for preserving critical breeding habitat.

Priority sage-grouse habitat



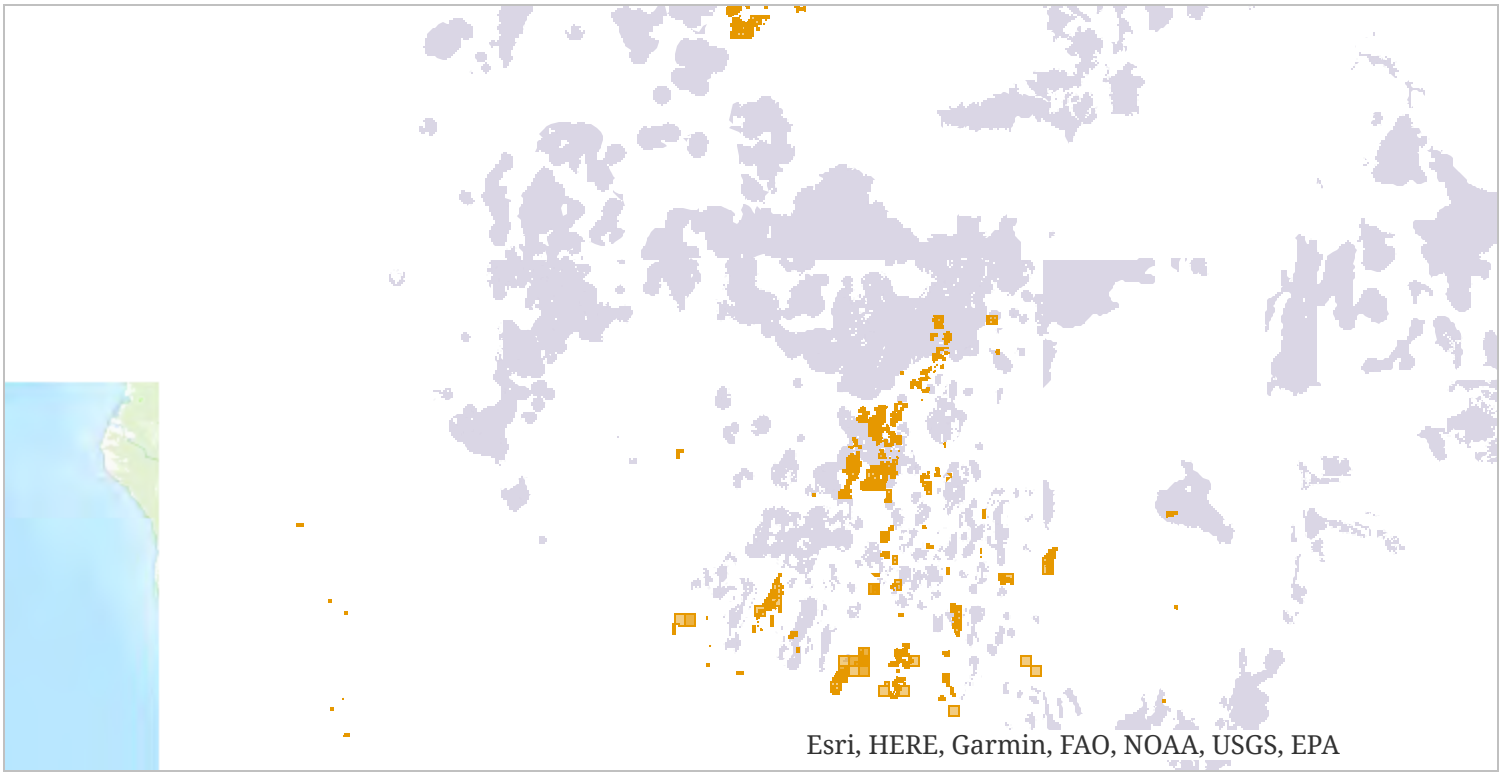
But the Trump administration weakened the landmark plans in an effort to allow more oil and gas drilling on public lands.

Federal oil and gas leases

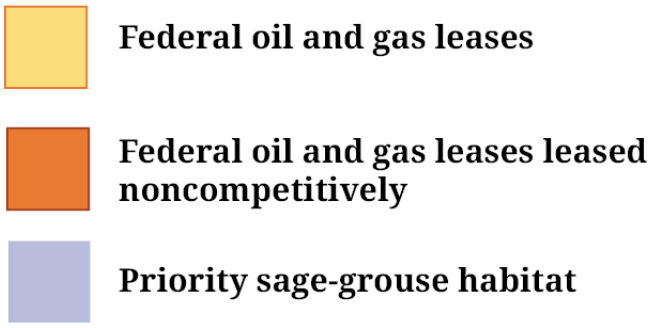
Priority sage-grouse habitat

In September 2018, the Bureau of Land Management offered (link: https://thenevadaindependent.com/article/a-u-s-senator-a-top-oil-lobbyist-and-a-hard-line-environmentalist-question-blm-oil-and-gas-leasing) 295,000 acres of public land in Nevada for oil and gas development, many of them in prime sage-grouse habitat.

Exactly zero of them sold at competitive auction, leaving all 144 parcels available for noncompetitive leasing.



Within two months following the sale, 21 leases were scooped up noncompetitively for just $1.50 per acre. Here's a look at noncompetitive leases in Nevada's sage-grouse priority habitat management areas.



Across Colorado, Idaho, Montana, Nevada, Oregon, Utah, and Wyoming, the six states with the greatest amount of sage-grouse habitat, 27 percent of oil and gas leases sold during the Trump administration (link: https://www.audubon.org/sites/default/files/greater_sage-grouse_habitat_reportfinal_20190725.pdf) are located in priority management areas.

Red Desert-to-Hoback migration corridor

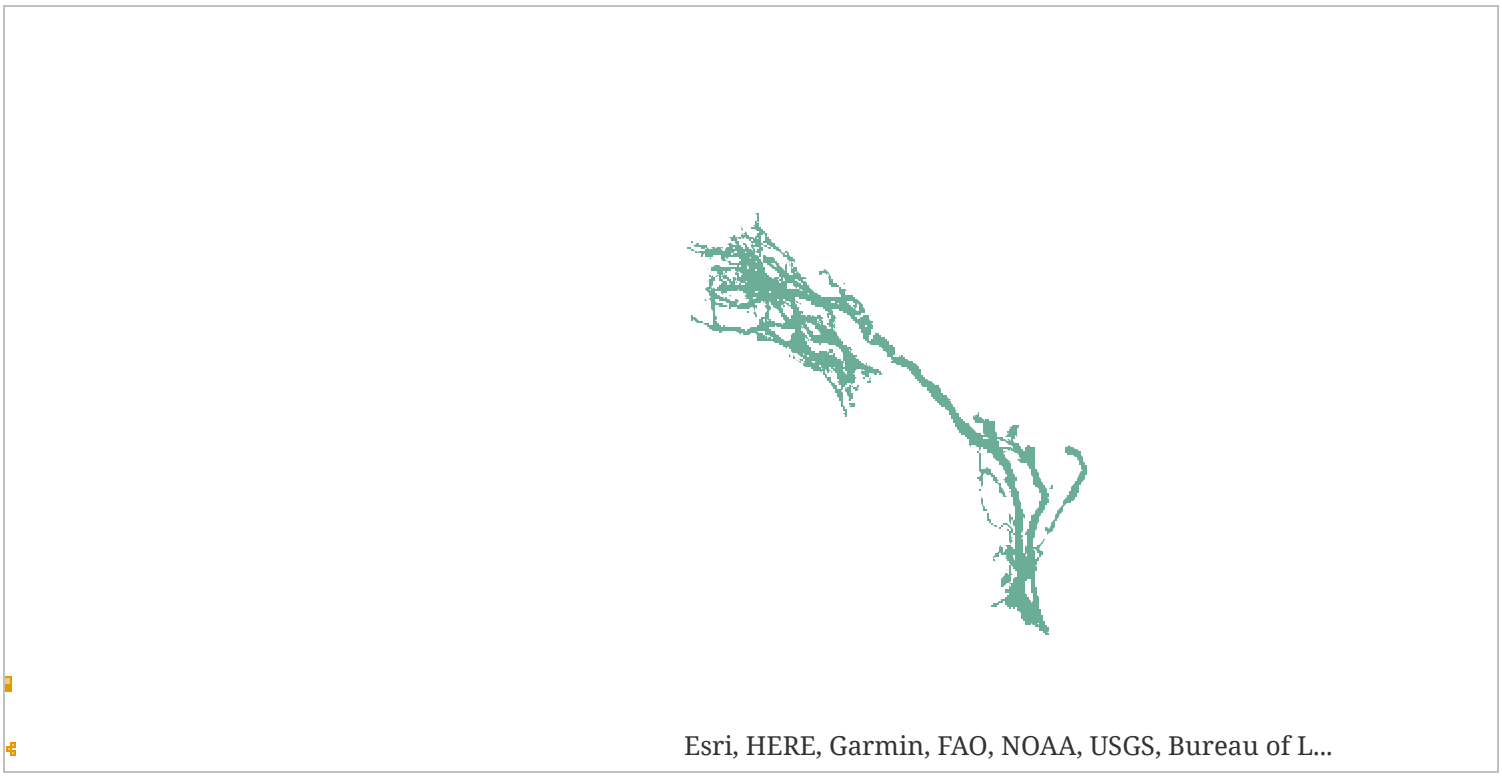
Big game species like elk, pronghorn, and mule deer traverse hundreds of miles between their summer and winter ranges each year, navigating by instinct and memory.

But energy development is creeping into critical breeding habitat. The oil and gas leasing process has failed to safeguard the West's wildlife. Nearly one-quarter (link: https://www.americanprogress.org/issues/green/news/2019/02/14/466218/trump-administration-selling-western-wildlife-corridors-oil-gas-industry/) of Western oil and gas leases offered since the start of the Trump administration lie in big game migration corridors or priority areas.

Red Desert-to-Hoback Migration Corridor

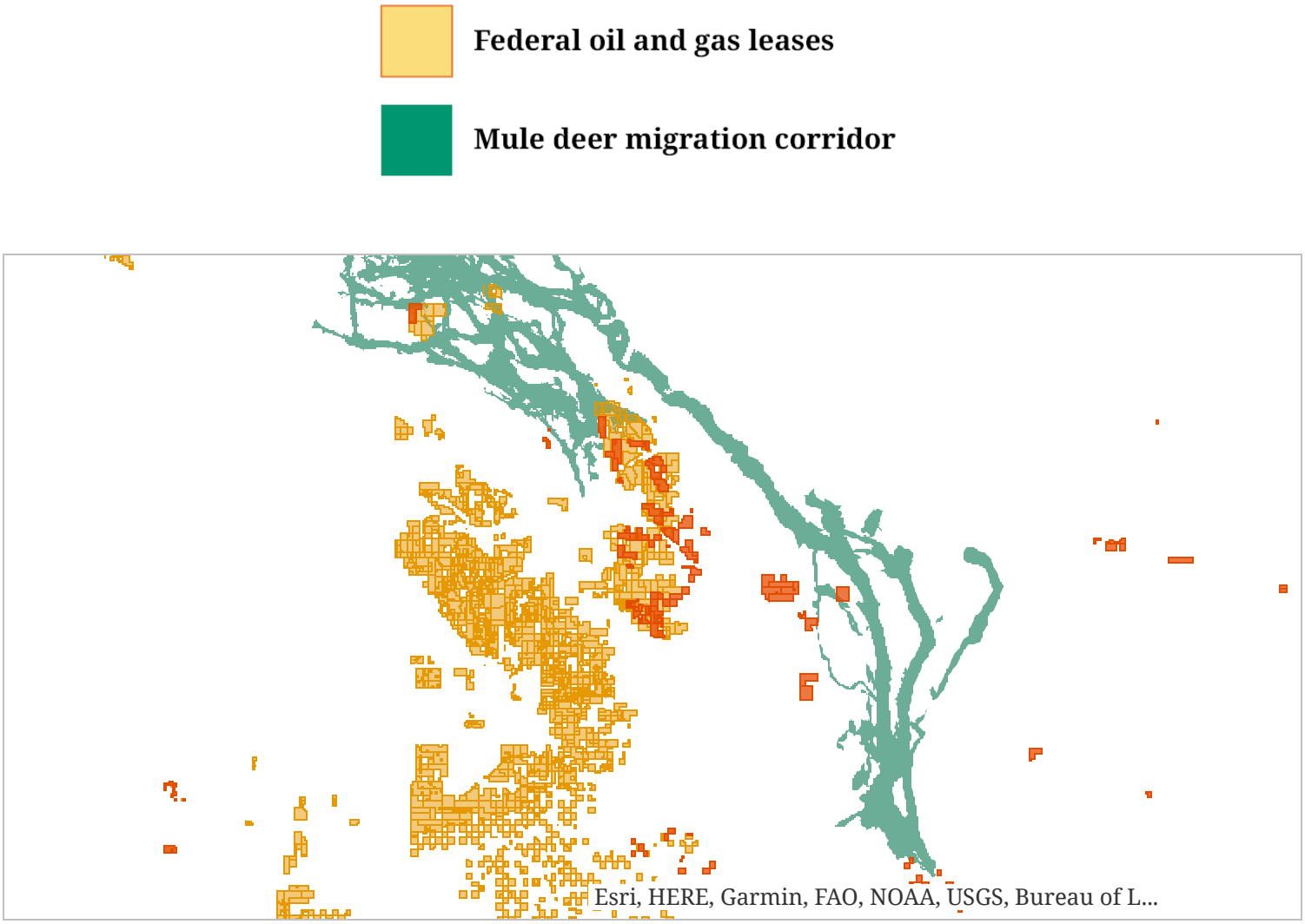
In southwestern Wyoming, leasing has encroached on the longest recorded mule deer migration.

Each year, mule deer complete a 150-mile journey (link: https://migrationinitiative.org/content/red-desert-hoback-migration-assessment) from their Red Desert winter range to the mountain slopes of the Hoback Basin, a route crisscrossed by highways, fences, and other obstacles.

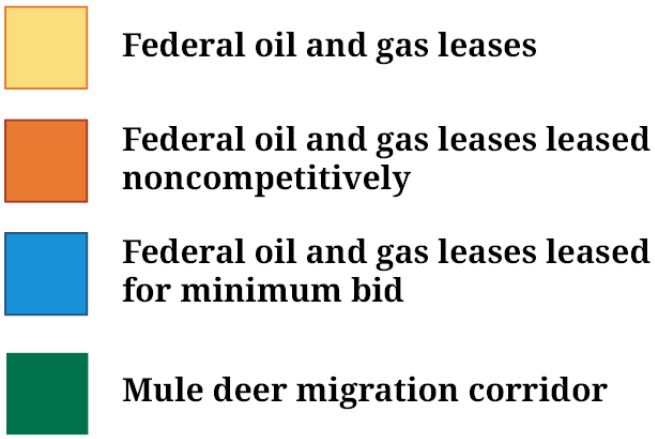


In 2018, the Trump administration proposed 700,000 acres (link: https://trib.com/business/energy/sportsmen-push-back-on-oil-and-gas-leasing-in-western/article_2191d5db-834b-5754-aafc-d75bf400c271.html) of oil and gas leases in the migration corridor.

While some of the proposed leases were withdrawn after outrage from hunting advocates, the administration has moved forward with oil and gas leasing within the Red Desert-to-Hoback route.



A number of oil and gas leases within the critical migration corridor were leased for pennies on the dollar—just $2.00 per acre for minimum bid leases and $1.50 per acre for noncompetitive leases.



The modern leasing process

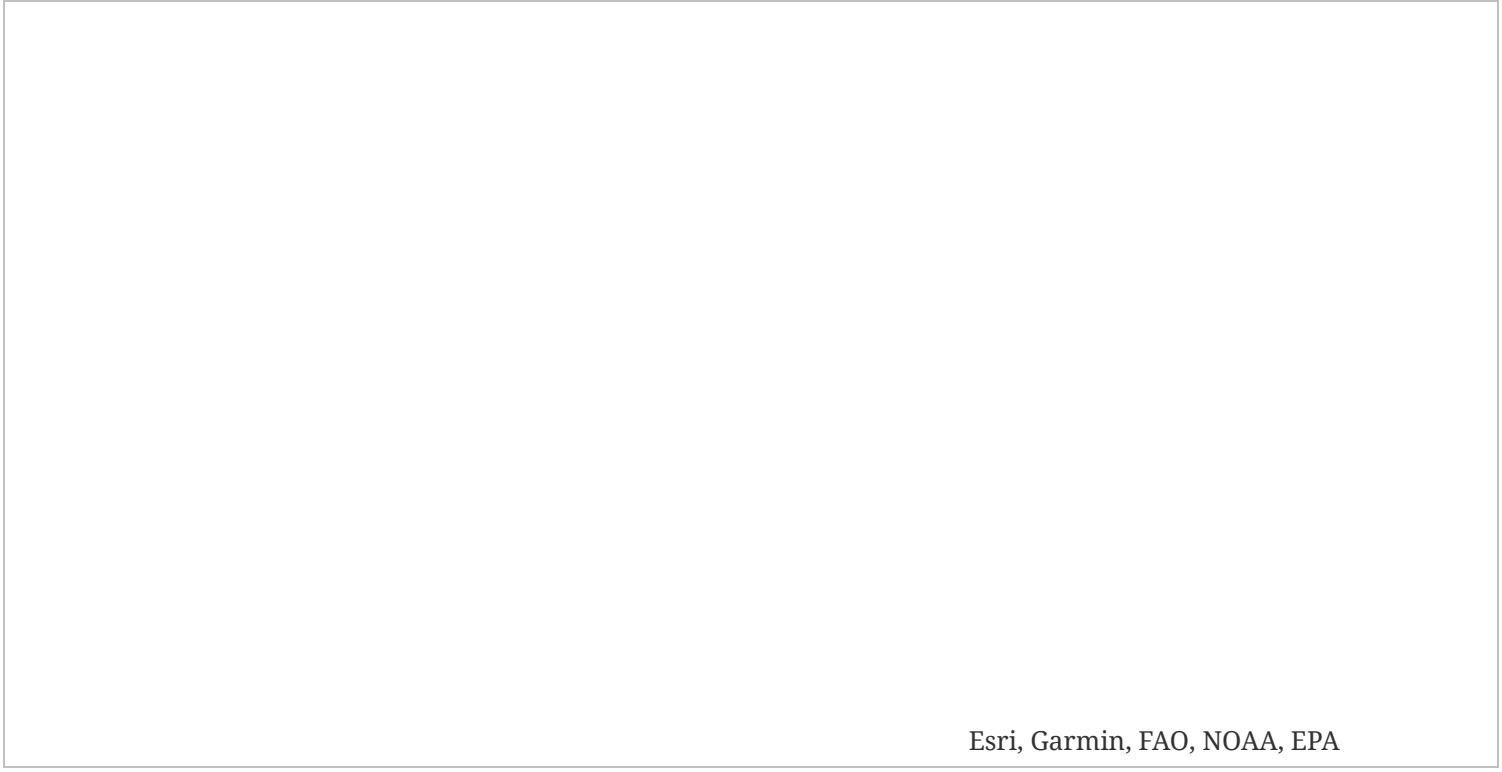
In 1987, Congress passed legislation to modernize the federal government's oil and gas leasing system, which was first outlined nearly a century ago in the Mineral Leasing Act of 1920. This analysis shows that those changes were ultimately inadequate. The modern era of oil and gas leasing on public lands is characterized by a system tilted towards the oil and gas industry. Private companies drive the leasing process, pay extremely low rates to taxpayers, and are not held accountable for the long-term impacts of development. Let's break it down step-by-step.

Turning public lands into private oil and gas leases

1. Companies nominate public lands to be leased for drilling

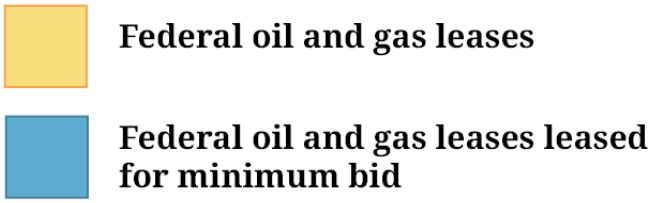
More than 750 million acres of taxpayer-owned oil and gas mineral rights (link: https://www.taxpayer.net/energy-natural-resources/locked-out-the-cost-of-speculation-in-federal-oil-and-gas-leases/) —mostly lying under public lands—are overseen by the Bureau of Land Management. The process to lease those lands for oil and gas drilling is driven by private oil and gas companies who nominate parcels to be sold at auction, oftentimes anonymously. The BLM does not consider the likelihood of a lease entering production during the vetting process.

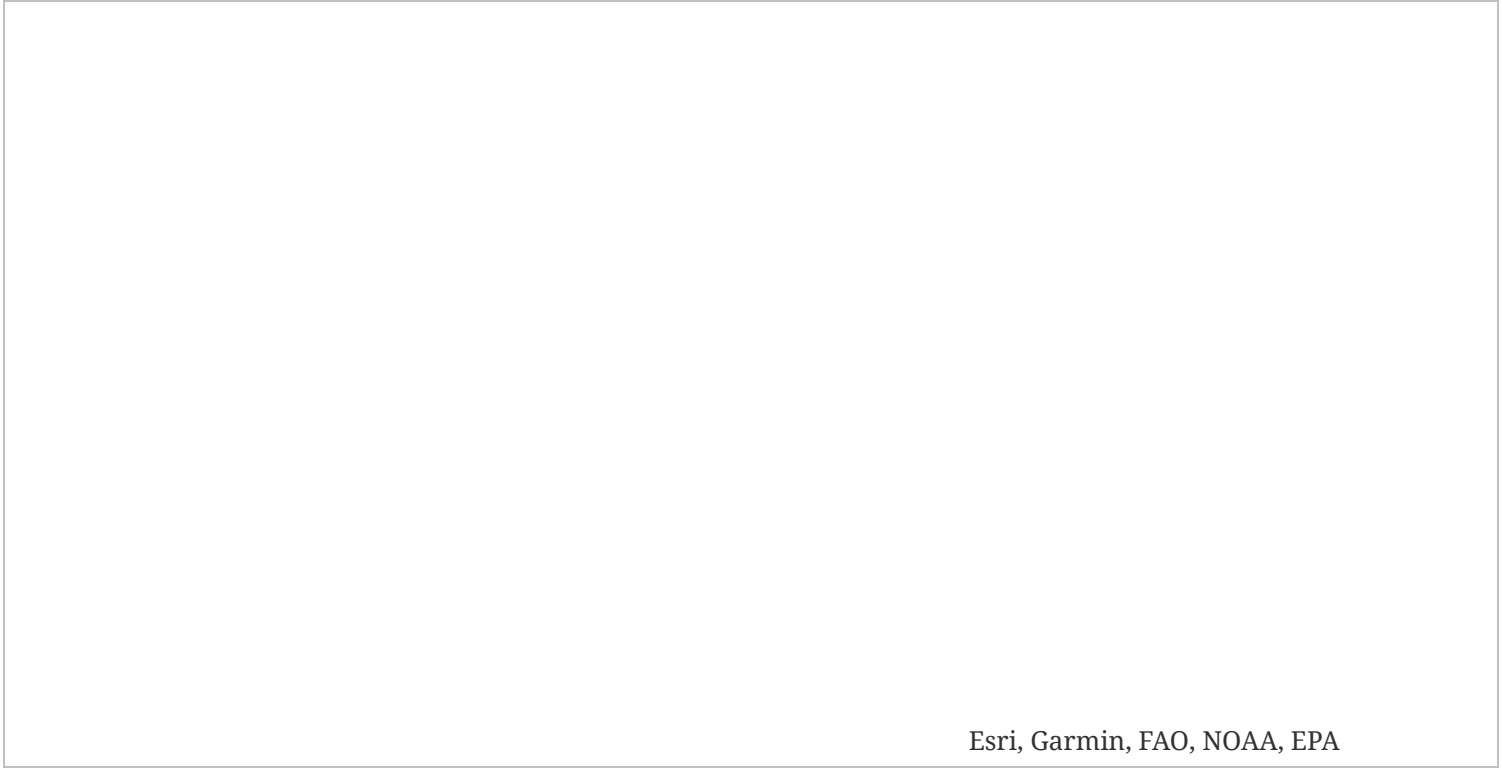
Federal oil and gas leases



2. Leases are sold competitively at auction starting at a minimum of $2.00 per acre

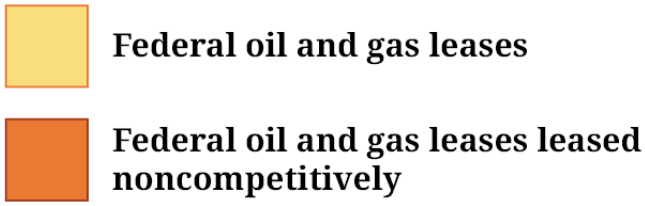
By law, the BLM offers all oil and gas leases through a competitive auction system. Public lands are sold for as low as $2.00 per acre, the minimum bid required. This amount has not been increased in decades. According to the analysis, 13.9 million acres of oil and gas leases have been sold for the minimum bid since 1987.

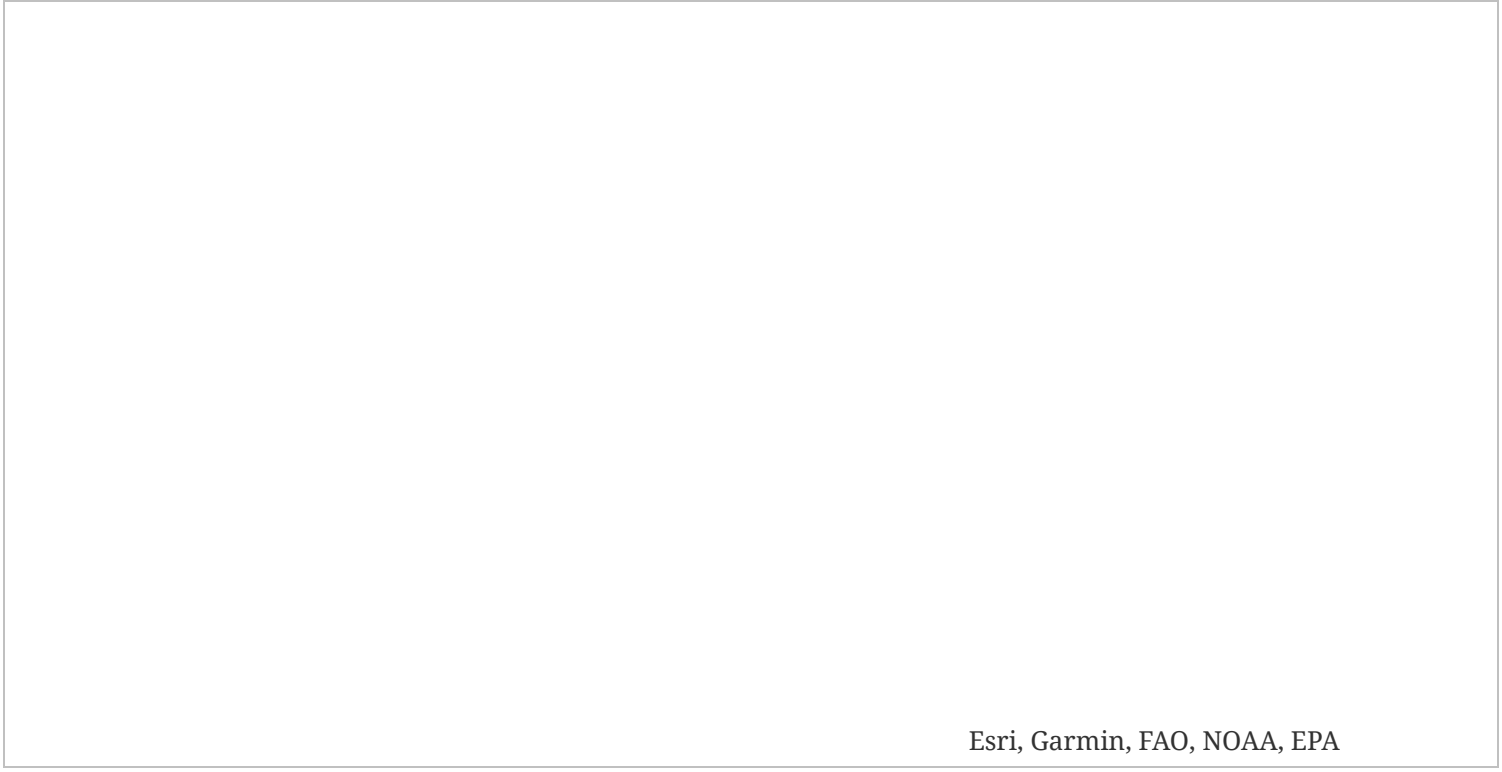




3. If leases fail to sell at auction, they’re available for purchase noncompetitively for just $1.50 per acre

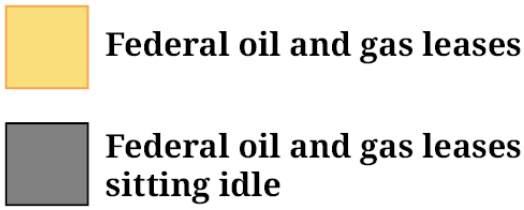
If public lands fail to sell at auction, they’re still available to purchase noncompetitively starting the very next day (and for up to two years following). Unsold acres go for a nominal administrative fee and the first year’s rent of just $1.50 per acre—the bid requirement is entirely waived. According to the analysis, over 28.2 million acres of public lands were purchased noncompetitively since 1987.





4. Companies can sit on leases for 10 years or longer before drilling, paying just $1.50 per acre annually to keep them idle

As of August 2019, over 17.7 million acres of public lands were leased by oil and gas companies in the West. Of those acres, 8.3 million, or approximately half, sit idle.



Oil and gas companies frequently stockpile leases but fail to produce on them. It costs only $1.50 per acre annually (and $2.00 per acre annually after five years) to sit on public land leases, a small cost for not generating any oil and gas. The existence of these non-producing leases limits the BLM's ability to manage the land for other uses, such as conservation and recreation.

5. If a company fails to pay the annual fees, the lease is terminated

If oil and gas companies pay annual rental fees, they have up to 10 years to develop a lease before it expires. Even if the lease is still sitting idle at the end of the 10-year term, the Bureau of Land Management regularly grants lease extensions (link: https://www.gao.gov/products/GAO-18-411) which can last for decades. If companies don't pay the annual fees, the leases are simply terminated with no additional penalties.

6. Companies pay extremely low, outdated royalty rates on oil and gas produced

Oil and gas companies are required to pay royalties to taxpayers for oil and gas extracted from public lands. Federal royalty rates are set at 12.5 percent, a rate that was first established a century ago. In contrast, states across the West charge companies between 16.67 percent and 25 percent for the ability to produce oil and gas on state-owned lands.

7. Even with safeguards in place, companies can abandon oil and gas wells, leaving taxpayers with the reclamation bill

Companies are required to put up a bond—or insurance—to cover a portion of the cleanup costs of a well. Current bonding requirements are woefully inadequate to cover those costs, and because the U.S. government has not updated bonding levels in over 50 years, the problem is only getting worse.

When Congress established the modern leasing system in 1987, they set a nationwide minimum bid—a floor of $2.00 per acre paid at auction in addition to the first year's rent—and developed the current practice of first offering leases through a competitive auction, then offering unsold leases noncompetitively. (Previously, public lands were offered either competitively or noncompetitively depending on whether they were known to contain oil or gas.) The intent of this system was to harness market forces to dictate lease prices while still allowing for some amount of exploration on unproven land. The next section explores how these efforts opened the door for speculation and failed to generate a fair return for taxpayers.

What happens to low cost leases?

There are major problems with the federal government's oil and gas leasing system. First, Congress has not updated the rates it set in 1987. The minimum bid and the annual rental rate no longer set an appropriate floor for the value of our public lands. Second, with the advancement of modern technology, few lands remain unexplored, eliminating the need to incentivize speculative exploration with low-cost leases. Yet the BLM continues the practice of leasing millions of acres of public lands for the minimum bid and noncompetitively. As a result, minimum bid leases and noncompetitive leases often sit idle and are ultimately terminated, tying up public lands that rarely produce royalty-generating oil and gas (link: https://www.americanprogress.org/issues/green/reports/2018/08/29/455226/oil-gas-companies-gain-stockpiling-americas-federal-land/) , shortchanging taxpayers, and limiting other uses like outdoor recreation and wildlife conservation.

In numerous instances, the BLM has declined to manage lands for other uses due to existing but undeveloped oil and gas leases. For example, in its land use plan (link: https://eplanning.blm.gov/epl-front-office/projects/lup/9506/58518/63310/BB_PRMP_FEIS.pdf) for Wyoming's greater Bighorn Basin region, the BLM opted not to protect numerous "Lands

with Wilderness Characteristics" due to existing but undeveloped oil and gas leases. Similarly, in the official planning decision (link: https://eplanning.blm.gov/epl-front-office/projects/lup/67041/83197/99802/Price_Final_Plan.pdf) for its Price field office in Utah, the agency evaluated an option to "emphasize protection of wildlife habitats, natural resources, ecosystems and landscapes," but opted against it out of concern that imposing restrictive protections "could severely and unnecessarily limit development of and access to existing oil and gas leases…"

Since 1987, more than 42.1 million acres have been leased at the minimum bid or noncompetitively. These leases expire or are terminated at a higher rate than leases purchased competitively, and many lapse without ever producing oil and gas (link: https://www.americanprogress.org/issues/green/reports/2018/08/29/455226/oil-gas-companies-gain-stockpiling-americas-federal-land/) .

The rate at which leases expire or terminate is a direct reflection of their potential to produce oil and gas. By law, a lease that is producing may be extended beyond its standard 10-year term. Conversely, non-producing leases typically may not be extended; and even before the end of their 10-year term, leases that are unlikely to produce are often terminated because the lessee simply stops paying rent.

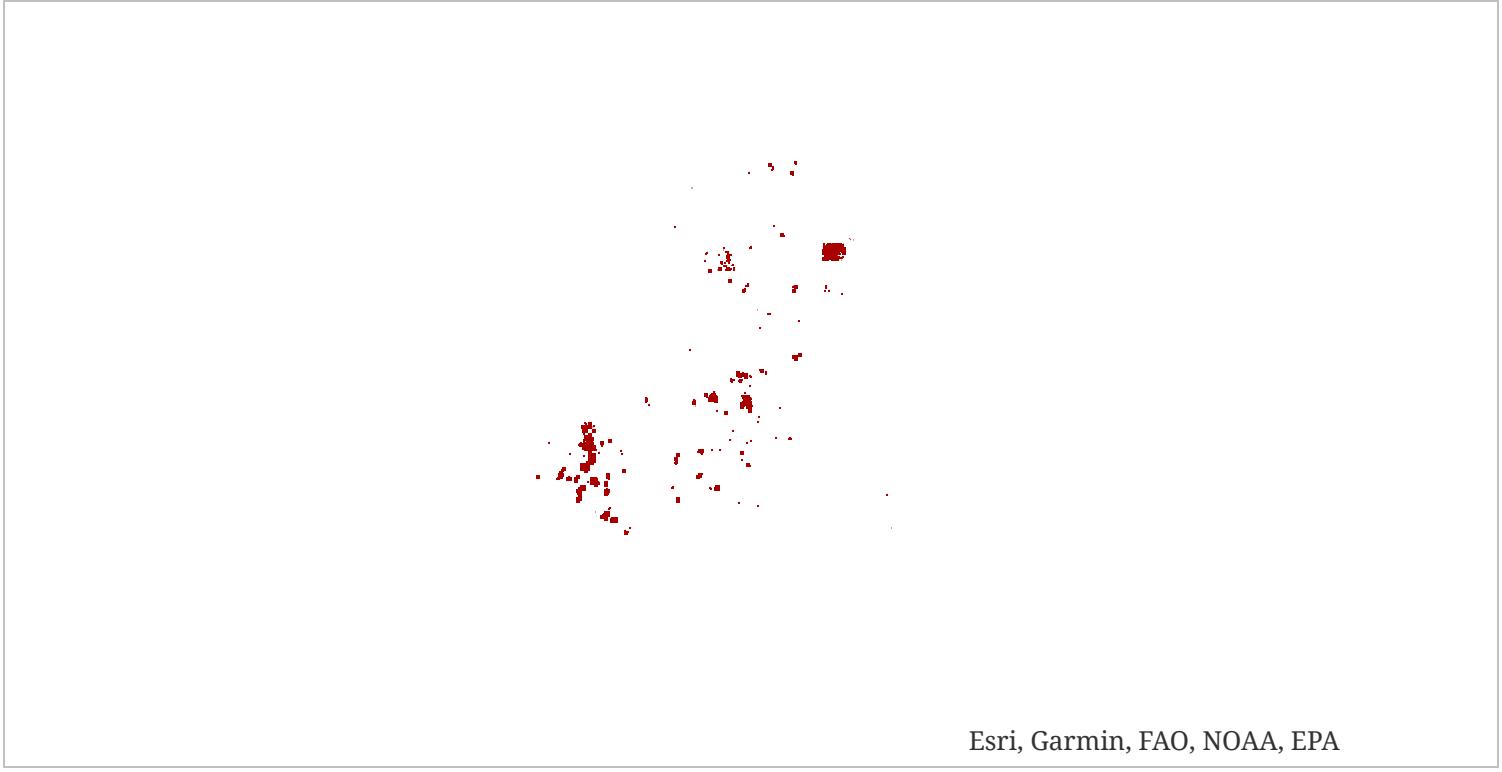
Low-cost noncompetitive and minimum bid leases expire or terminate at higher rates than leases issued competitively for more than the minimum bid. Of all the above-minimum bid leases issued since 1987, about a fifth, or 21.3 percent, are still active. In contrast, 9.7 percent of minimum bid leases and just 5.6 percent of noncompetitive leases are active. These numbers show that noncompetitive leases are the least likely to produce oil and gas, minimum bid leases are the second least likely, and above-minimum bid leases are the most likely to enter production.

Because the BLM considers oil and gas leases, even if they are undeveloped, an impediment to managing for wildlife conservation, wilderness protection, or outdoor recreation, low-cost leases tie up public lands during the years they sit idle (link: https://www.wilderness.org/articles/blog/no-exit-how-our-public-lands-are-fated-oil-and-gas-development) .

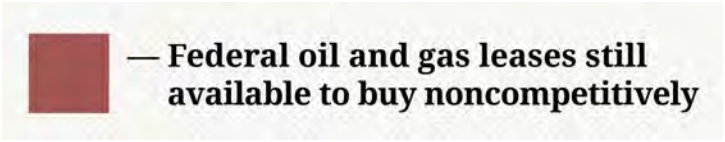
What's at risk?

In the last two years, the Trump administration has offered 2.1 million acres that failed to sell at auction. Leases for each and every one of those acres are still available for purchase on an over-the-counter basis for just $1.50 per acre (the first year's rent) and a small administrative fee. Explore the map below to see which public lands are still on the table for oil and gas companies to lease for bargain prices.

Public lands still available to lease for $1.50 per acre



Across Western states, 2.1 million acres of public lands are currently on the table for oil and gas companies to lease noncompetitively.



Conclusion

The federal government's oil and gas leasing system sits on a 100-year old foundation, hasn't been updated in 32 years, and is desperately in need of reform. Currently, the leasing system locks up huge amounts of the West's public lands, frequently at bargain prices. Of the 17.7 million acres currently leased, 8.3 million are sitting idle, generating only a $1.50 per acre annual return for taxpayers.

Congress must modernize the oil and gas leasing system to give taxpayers a fair share and ensure that we can conserve our natural heritage alongside development. Key updates to the current leasing system should include:

- *Identify lands suitable for oil and gas leasing through comprehensive and inclusive planning processes, including robust public participation, instead of through industry nominations*
- *End the practice of leasing lands with little to no oil and gas potential*
- *Raise the national minimum bid from $2.00 per acre to at least $10.00 per acre, and establish a process for periodic updates to account for inflation*
- *Eliminate noncompetitive leasing, instead allowing unsold parcels to be offered at a competitive auction in the future*

- *Raise the annual rental rate from $1.50 per acre to at least $3.00 per acre, and establish a process for periodic updates to account for inflation*
- *Raise the royalty rate for onshore oil and gas to match the federal offshore rate and leading Western states*
- *Shorten the duration of the standard lease term and raise the bar for companies to have terminated leases reinstated*
- *Before issuing a lease, require lessees to demonstrate a capacity of exploring and producing oil and gas*

Methodology & data definitions

To conduct this analysis, we collected publicly available data from the Bureau of Land Management's oil and gas leasing database, called the Legacy Rehost System or LR2000. Although LR2000 is outdated and opaque, we were able to gather detailed records for all oil and gas leases by querying the database for the following: when the lease was acquired, whether the lease was sold competitively or noncompetitively, the bid amount if it was sold competitively, and the lease production status.

LR2000 also provides information on lease developers, actions taken over the course of the lease, and a Public Land Survey System (PLSS) description. Because the lease PLSS information amounts to a description of the parcel's location as a subdivision of public lands into townships and sections, it is difficult to spatially map the data provided by LR2000. To address this, The Wilderness Society developed a tool—called the Federal Lands Use and Resource Transparency Tool, or FLURTT—to mine, parse, and translate LR2000 data into mappable GIS datasets. We relied on FLURTT for the entirety of this analysis.

LR2000 often contains outdated information, those inaccuracies were likely carried through into our analysis. However, despite its limitations, LR2000 is the only database of federal oil and gas leases available to the public. There are a number of additional caveats to consider:

Lease location: In some cases, the leases generated from FLURTT did not represent the actual lease boundaries and instead scaled up to entire map sections or townships (subdivisions of the Public Land Survey System). In these cases, we approximated the lease shape within the appropriate area. Thus, the maps are are approximations at fine scale. However, the actual lease acres involved in the analysis were reported by LR2000 and not calculated using FLURTT.

Minimum bid identification: Approximately 3 percent of the lease files pulled from LR2000 did not have bid amounts or could not be translated by FLURTT. Although these leases were included in the total acreage leased, they were excluded from all analyses involving minimum bids.

Idle lease identification: We considered leases producing if they were listed as "held in production" in LR2000. A number of leases were "held in production" due to their location within a producing well field, even if the lease itself didn't contain a producing well. Thus, the number of idle leases is, if anything, an underestimate.

For a detailed methodology and description of the analysis please click HERE (link: https://docs.google.com/document/d/1oSVm2sOBxllsRerXSSnlXtXFnWvnAZDqyRkAiSl42K4/edit?usp=sharing) .

The Wilderness Society | Center for Western Priorities

Additional Map Resources:

Bureau of Land Management records of oil and gas leases, as of May 2019 (link: https://wilderness.maps.arcgis.com/apps/webappviewer/index.html?id=fd1c2f382a6a4920b4bc56d5bc7982c7)

Upcoming Bureau of Land Management oil and gas lease sales, as of August 2019 (link: https://wilderness.maps.arcgis.com/apps/webappviewer/index.html?id=2eaa8f30a08f4e6497e78666b2b235d8)

Oil and gas industry expression of interest for lease sales, as of May 2019 (link: https://wilderness.maps.arcgis.com/apps/opsdashboard/index.html#/a7ce6c93a8ce43a19337692b3de7592e)

LR2000 GIS Web Services (link: https://gis.tws.org/arcgis/rest/services/LR2000)

This map is a collaboration between the The Wilderness Society (link: https://www.wilderness.org/) and the Center for Western Priorities (link: http://westernpriorities.org/) .

The Wilderness Society	Connor Bailey, Mackenzie Bosher, Kim Stevens
The Center for Western Priorities	Jesse Prentice-Dunn, Andre Miller, Lucy Livesay
Federal lease data	The Bureau of Land Management, Legacy Rehost System
Cover photo	The Wilderness Society, Mason Cummings
Dinosaur National Monument photo	National Park Service, Dinosaur National Monument
Sage-grouse photos	The Bureau of Land Management
Mule deer photo	U.S. Fish and Wildlife Service
Red Desert-to-Hoback migration corridor photo	The Wilderness Society, Mason Cummings
Oil pumpjack photo	The Wilderness Society, Mason Cummings
Aerial photo of oil field	EcoFlight
Natural gas rig photo	U.S. Fish and Wildlife Service

Oil pumpjack photo	Department of Energy
Twin oil pumpjacks photo	The Wilderness Society, Mason Cummings

Exhibit 5:

"Energy Speculators Jump on Chance to Lease Public Land at Bargain Rates", The New York Times, Nov. 27, 2018.

The New York Times | https://nyti.ms/2DKnl4a

Energy Speculators Jump on Chance to Lease Public Land at Bargain Rates

The Trump administration's policy of encouraging more oil and gas drilling combined with a loophole in federal rules has been a boon for investors with a taste for gambling — and has drawn criticism that it is a bad deal for taxpayers.


By Eric Lipton and Hiroko Tabuchi

Nov. 27, 2018

MILES CITY, Mont. — Robert B. Price, the chief executive of a London-based oil and gas company, came up with a creative tactic to grab bargain drilling rights to a sprawling piece of federal land here in eastern Montana — each acre for less than the price of a cup of coffee.

He first asked the Interior Department to auction off rights to as much as 200,000 acres in Montana through a process that allows energy companies to identify the public land they would like to develop. But when the auction took place last December, Mr. Price sat on the sidelines and waited for the clock to run out — betting no one else would bid.

His gamble worked. With no other bidders showing interest, the government allowed him to secure drilling rights on nearly 67,000 acres east of Miles City in a special noncompetitive sale the very next day. His cost: just $1.50 an acre a year in rent, compared with the more than $100-an-acre average paid by bidders, on top of rent, in competitive auctions in Montana in the final four years of the Obama administration.

"We're still interested in much more," said Mr. Price, reached by phone before he was scheduled to fly to London to meet with his investors.

Robert B. Price's gamble that no one else would bid on the land he was eyeing in Montana paid off. Eric Anderson/Highlands Natural Resources

The maneuver is one of many loopholes that energy speculators like Mr. Price are using as the Trump administration undertakes a burst of lease sales on federal lands in the West.

Major oil and gas companies like Chevron and Chesapeake Energy are frequent buyers of the leases. But the Trump administration has put so much land up for lease that it has also created an opening for super-low-price buyers like Mr. Price.

The plots of land the speculators bid on typically sell for such dirt-cheap prices because there is little evidence that much oil or gas is easily accessible. The buyers are hoping that the land will increase in value nonetheless, because of higher energy prices, new technologies that could make exploration and drilling more economical or the emergence of markets for other resources hidden beneath the surface.

In some cases they hope to resell access to deep-pocketed oil companies at a premium. In others they are hoping to raise money to search for oil or gas on their own. Either way, they are the latest in a long line of speculators willing to take a shot — sometimes a very long shot — at a big payoff in America's oil fields.

The percentage of leases being given away through noncompetitive sales, like the one that Mr. Price engineered, surged in the first year of the Trump administration to the highest levels in over a decade, according to an analysis of federal leasing data by Taxpayers for Common Sense, a nonpartisan group that highlights what it considers wasteful actions by federal government agencies.

In states like Nevada, noncompetitive sales frequently make up a majority of leases given out by the federal government, the group's database shows.

The growth of the amount of land put up for lease combined with the sharp increase in noncompetitive leasing has resulted in major drops in the price companies pay per acre in certain states, like Montana, where the average bid has fallen by 80 percent compared with the final years of the Obama administration.

Two Grand Junction, Colo., business partners, for example — a geologist and a former Gulf Oil landman — now control 276,653 acres of federal parcels in northeastern Nevada. But they are still looking for the money they need to drill on the land, or even to pay for three-dimensional seismic surveys to determine whether there is enough oil there to try.

In the case of Mr. Price, whose investors include Haliburton, the oil-services industry giant, he is convinced that there is an unusually high level of helium mixed in with natural gas that could be drilled in eastern Montana. Because helium sells at a much higher price than even oil, he is selling investors on the potential for lucrative returns. But the prospect of him delivering remains in doubt.

Rajan David Ahuja, vice president at R&R Royalty, a Texas-based company that has leases on land roughly equivalent to the size of Rhode Island, said that building landholdings like this was a crapshoot.

"We don't make money on 90 percent of the things we do," Mr. Ahuja said. "It is a really risky game."

The surge in noncompetitive transactions has intensified debate over how well the federal government handles the task of auctioning off access to taxpayer-owned lands. Taxpayers get 12.5 percent of revenues produced from any oil or gas extracted from leased public land — or nothing but trivial rent payments if speculators fail to develop the land successfully.

More than 11 million acres of land leased by the federal government lies idle — or about half of all the land out on lease — property that may or may not ever be drilled for oil and gas.

The speculation, critics say, allows companies to lock up millions of acres of federal land in leases, complicating efforts to set it aside for other uses, such as wildlife conservation areas or hunting and recreation zones.

"People come to Montana and stay in Montana not because of the best weather or highest wages or the best beaches," said John Todd, the conservation director at the Montana Wilderness Association. "They come here because we have access to ample public land, most of it that is in the same shape as it was when Lewis and Clark came here or before that."

Because the speculators can resell the leases, they could also reap the gains from any increase in the value of their landholdings, gains that otherwise would go to American taxpayers, said Ryan Alexander, president of Taxpayers for Common Sense.

"We should not be flooding the market so it is easy for companies to sit back and wait to get to leases at fire-sale prices," Ms. Alexander said. "The acceleration of leasing is doing just that. The industry is getting a great deal and taxpayers are not."

Ryan Zinke, the interior secretary, said this month that overall taxpayer revenue from energy production on federal lands jumped in 2018 as a result of rising production in states like Wyoming and New Mexico.

“President Trump’s energy dominance strategy is paying off, and local communities across America are the beneficiaries,” Mr. Zinke said in a statement.

The Speculators’ Walmart

Inside the George R. Brown Convention Center in downtown Houston, thousands of energy industry executives converged in August for an event known as Summer NAPE, a giant gathering of hundreds of owners of potential oil and gas drilling sites. Most of them were there to raise money to turn their speculative gambles into real drilling plans.

“STRIKE WHILE THE DEALS ARE HOT,” the banner at the entrance to the meeting hall said.

At Booth 2315, in front of a poster boasting about the more than 261,000 acres of federal leases they had secured in Nevada, stood Larry R. Moyer, a Colorado-based oil geologist, and his business partner, Stephen Smith, a former Gulf Oil landman, pitching their land to any prospective investor who walked up.

“You want to get in our deal — get your checkbook out,” Mr. Smith said to one visitor.

Northern Nevada, Mr. Smith admits upfront, is a risky place to look for oil. Nevada has one of the highest percentages in the country of leased land that is sitting idle: Just 3 percent of the 715,441 acres of federal land in the state leased for oil and gas were actually producing energy as of late last year.

“There are a lot of people who have spent a lot of money drilling dry holes in the past,” Mr. Smith said.

“We are working to overcome the conventional wisdom,” Mr. Moyer added.

Mr. Moyer took to a small stage at the Houston conference for a “Shark Tank”-like presentation.

“What we are looking for — or we would ask someone — is about $10 million,” Mr. Moyer said, money they would use for a seismic survey and to drill test wells.

“If you find a billion barrels, your finding cost is going to be a penny a barrel,” he said before wrapping up his presentation by saying, “Think about taking a swing.”

Waiting on the Sidelines

The bidding process typically begins when an oil and gas company asks the Interior Department to open up a new chunk of taxpayer-owned land to drilling.

Once the department agrees, it schedules an internet-based auction for registered bidders. Hot competition for the most sought-after land, where there are proven energy reserves, can drive these so-called bonus bids up close to $100,000 per acre, as happened in New Mexico in September. But to ensure that there is at least some upfront payment, the Interior Department requires a minimum per-acre bid of $2.

But there is a loophole. If no one bids, the land is then transferred into a program that allows anyone to approach the department within two years of the auction, without an upfront bid payment.

The only money that needs to be put down is the $1.50-per-acre annual lease payment for the first year of a 10-year lease, and a $75 filing fee. This is how Mr. Price managed to secure access to land in Custer County, east of Miles City, part of the 116,000 acres of federal leases his company, Highlands Montana, says it holds.

“We’re a small company. We didn’t want to get in a bidding process,” said Mr. Price, whose company has raised at least $6 million from investors since 2016.

Mr. Moyer and Mr. Smith also secured a large share of their holdings in Nevada through these noncompetitive purchases, after sitting and watching the auctions play out without bidding.

But Neil Kornze, the former head of the Bureau of Land Management, the branch of the Interior Department that runs the leasing process, said this was a flawed policy.

“Someone should have to bid in the auction to get the land,” said Mr. Kornze, who served as director in the final three years of the Obama administration.

The Trump administration made three times as much land available to bid on in the last fiscal year as the average for the last four years of the Obama administration. But only about 11 percent of the land attracted any bidders in 2018 — a total of 1.35 million acres. The rest of that land is now available for noncompetitive leases.

Highlands Montana has drilled a few test wells on adjacent state land it has leased here. But for now, most of Mr. Price’s leased land remains undeveloped.

Large-scale development would be quite a shock in this part of Montana, where there is now very little oil and gas drilling.

From the back porch of the cattle ranch owned by Karen Aspevig Stevenson and her husband, the view stretches for miles, with ponderosa pines and juniper bushes swaying in a wind that blows so strong it sounds almost like ocean waves.

“This is our public lands. We all own this land,” Ms. Stevenson said, as she walked through the rolling hills, her cattle-herding dog running ahead. “To come in here and just start drilling — that does not make sense.”

Eric Lipton reported from Miles City and Houston, and Hiroko Tabuchi from New York. Rachel Shorey contributed research.

Exhibit 6:

Harmonizing Preservation and Production; How Modernizing the Department of the Interior's Fiscal Terms for Oil, Gas, and Coal Leases Can Ensure a Fair Return to the American Public.

New York University School of Law; Institute for Policy Integrity.

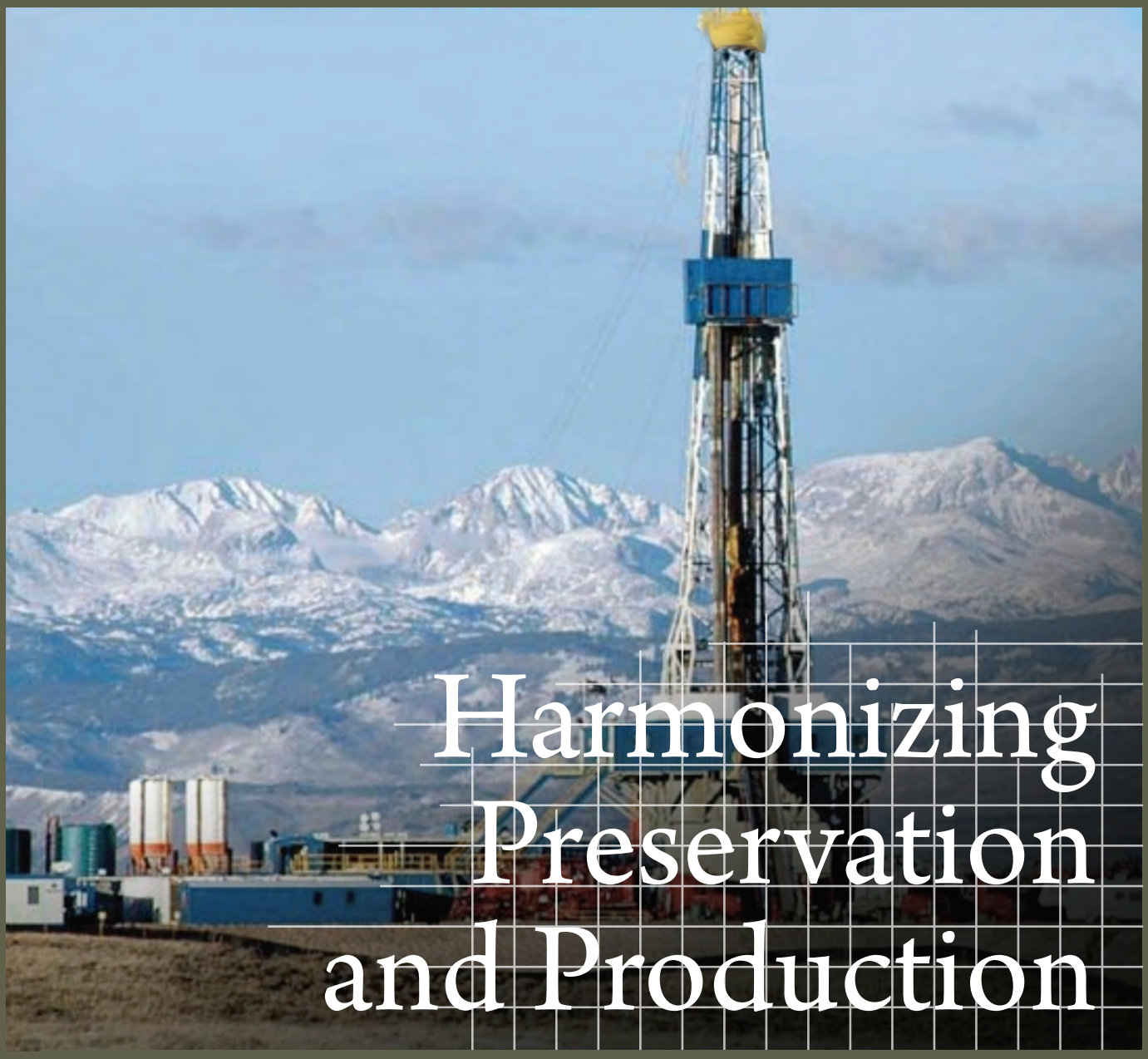


Photo by The Pinedale Field office of the BLM

Harmonizing Preservation and Production

How Modernizing the Department of the Interior's Fiscal Terms for Oil, Gas, and Coal Leases Can Ensure a Fair Return to the American Public

Institute *for* Policy Integrity
new york university school of law

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Executive Summary

Spurred by advances in technology such as hydraulic fracturing and directional drilling, domestic oil and natural gas production has risen steadily for the past ten years, providing an important source of energy and revenue for the federal government and states.[1] Oil production increased 67 percent between 2005 and 2014, and natural gas production increased 36 percent.[2] The U.S. Energy Information Administration projects that U.S. crude oil and natural gas production will continue to rise through 2020, and that the United States will become a net natural gas exporter by 2017.[3]

The U.S. Department of the Interior ("Interior") oversees more than 260 million surface acres and 700 million subsurface acres of mineral resources onshore, and more than 1.7 billion acres offshore in the waters of the Outer Continental Shelf.[4] Federal energy production generates one of the largest non-tax sources of revenue for the United States, accounting for more than $14 billion in fiscal year 2013.[5] However, Interior does not systematically evaluate or update the fiscal terms for oil, gas, and coal production on federal lands.[6] In fact, some of its fiscal terms—including royalty rates for onshore oil and gas production—have not changed since 1920.

Photo by Sara Francis, U.S. Coast Guard

The U.S. Government Accountability Office has repeatedly called for Interior to reform its fiscal system, which may be depriving taxpayers of hundreds of millions of dollars each year from domestic energy production.[7] Among myriad issues, minimum bids are often set too low and fail to account for the option value of energy resources, which is the value of waiting for more information on energy prices and extraction risks before deciding whether and when to lease the public's energy resources to private companies. Lease sales are often uncompetitive, exacerbating the problem of low minimum bids.[8] Low rents do not account for the externalities associated with exploratory drilling and mining, nor the lost value of the public's use and enjoyment of federal lands during the rental period.[9] Further, outdated royalty rates fail to account for externalities and contribute to a relatively low U.S. government take, compared to many states and foreign countries.[10] Together, these deficiencies mean that Interior fails to obtain a fair return for development of the public's natural resources, contrary to the agency's mandate under the Federal Land Policy and Management Act, Mineral Leasing Act, and Outer Continental Shelf Lands Act.

This report focuses on one serious deficiency in the federal management of natural resources: the fiscal terms of federal leases do not require developers to internalize the environmental and social costs of fossil fuel extraction. In line with their statutory mandates under the Federal Land Policy and Management Act and the Outer Continental Shelf Lands Act, the U.S. Bureau of Land Management ("BLM") and Bureau of Ocean Energy Management ("BOEM"), each within the Department of the Interior, must account for these social and environmental costs when leasing and managing federal natural resources.

Interior's failure to value the environmental and social externalities associated with fossil fuel development on federal lands means that energy companies receive a financial windfall. The American public pays for the externalities associated with development that are not priced into the leasing contract and not otherwise addressed by environmental or tort law. These costs include local air pollution from exploration, development, and transportation to and from the well site; fugitive methane emissions, which contribute to climate change; habitat disruption; noise pollution; infrastructure wear and tear; and water contamination, among others. Failing to account for these costs in the terms of federal leases shifts them onto taxpayers, who already receive an improvidently low return for the right to exploit federal mineral resources.

Interior has the statutory authority and obligation to make changes to the current leasing program in order to earn a fair return for the American people and protect the environment. This report first discusses Interior's "dual mandate" both to develop energy resources and to preserve federal lands, as well as its requirement to secure fair market value for its leases. Next, the report describes how the current fiscal terms fail to earn a fair return for the public, and provides suggestions for reform. Specifically, Interior should:

- Raise minimum bids to account for option value, and evaluate methods to quantify option value for both offshore and onshore leasing;
- Ensure that rental rates incorporate the environmental and social externalities associated with exploration and resource development; and
- Increase royalty rates to reflect environmental and social costs that result from production.

The federal fiscal system for oil, gas, and coal leasing is long overdue for an update that could earn hundreds of millions of dollars for taxpayers each year and help ensure that the extent and timing of energy production on federal lands is efficiently balanced with conservation goals. This report's commonsense recommendations to modernize the fiscal terms of federal energy leases would help to provide a fair return for the public's valuable natural resources, and would harmonize the government's dual mandate of preservation and production.

Key Terms and Definitions Discussed in this Report

Externality: An effect that occurs when the production or purchase of market goods leads to costs or benefits that are not captured by the original producer or buyer. In other words, the transaction produces effects that are external to the market, leading to inefficient market outcomes. Pollution from mineral resource extraction that affects a third party is an example of an externality.

Fair Market Value: in the natural resources context, the value of the right to explore and, if there is a discovery, to develop and produce an energy resource. While "fair market value" is not defined in the relevant statutes governing oil, gas, and coal leasing, federal agencies have developed guidance to help ensure that the public receives fair return for the rights that it conveys.

Option value: the value of waiting to make an irreversible decision until critical new information arrives. One well-known example is stock options, which are valuable because they grant their holder the time to learn more about future stock prices before deciding whether to buy or sell. In the natural resource context, a conceptually identical methodology exists to determine the value of waiting to gain greater information about environmental, social, economic, and technological uncertainties, such as energy prices, extraction costs, and environmental sensitivities.

Part I: The Federal Leasing System

The Department of the Interior, through BLM and the BOEM, offers land to private parties for the extraction of oil, gas, and coal deposits through the sale of leases. BLM manages roughly 23,657 active oil, gas, and coal leases on 256 million onshore surface acres and 700 million onshore subsurface acres.[11] BOEM manages approximately 8,300 active oil and gas leases across 1.7 billion Outer Continental Shelf offshore acres.[12] Together, coal, oil, and natural gas produced on federal lands account for approximately 25 percent of the total fossil fuels produced annually in United States.[13]

Three primary statutes set forth Interior's duties with respect to national energy production and federal land management: the Federal Land Policy and Management Act and the Mineral Leasing Act for onshore development, and the Outer Continental Shelf Lands Act for offshore development. These statutes articulate three important principles: First, Interior must balance orderly production of energy on federal lands with environmental preservation and other competing uses. Second, Interior must receive "fair market value" for the right to explore and develop federal mineral resources. And third, Interior has the authority to establish and revise regulations for the primary fiscal terms of leases: bids, rents, and royalties. We review these three components in turn.

Federal Law Requires BLM and BOEM to Uphold the Dual Mandate to Both Produce Energy and Preserve Federal Lands.

The Onshore Dual Mandate

The Federal Land Policy and Management Act and the Mineral Leasing Act, as amended, give BLM authority to manage onshore federal lands and mineral resources. Enacted in 1976, the Federal Land Policy and Management Act provides that federal lands are to be used only for the advancement of the national interest.[14] The Act declares that:

> [P]ublic lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use.[15]

The Federal Land Policy and Management Act sets forth the dual mandate of development and preservation. Agen-

cies must both protect the environment[16] and manage federal lands in such a way as to provide for domestic sources of "minerals [including hydrocarbon energy resources], food, timber, and fiber."[17] The Act also requires agencies to develop land use plans,[18] and to manage public lands in accordance with them.[19]

The Federal Land Policy and Management Act requires agencies to manage public lands to allow for multiple uses.[20] "Multiple use" is defined as:

> [T]he management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people; . . . the use of some land for less than all of the resources; a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and nonrenewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historical values.[21]

"Multiple use" also refers to the "harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment with consideration being given to the relative values of the resources and not necessarily to the combination of uses that will give the greatest economic return or the greatest unit output."[22] The Act further requires that Interior "shall, by regulation or otherwise, take any action necessary to prevent unnecessary or undue degradation of the lands."[23] The statute's references to "multiple use" and direction to prevent "undue degradation" imply a cost-benefit calculus balancing resource extraction on the one hand against competing uses of the land and environmental protection on the other.

The Mineral Leasing Act of 1920 declares that it is the policy of the federal government and in the national interest to foster and encourage private enterprise in "orderly economic development of domestic mineral resources."[24] Among many provisions dedicated to oil, gas, and mineral leasing, the Mineral Leasing Act also provides that the Secretary of the Interior can issue regulations requiring that operators prevent "undue waste."[25] The Mineral Leasing Act also specifically requires oil and gas lessees (but not coal lessees) to "use all reasonable precautions to prevent waste of oil or gas developed in the land," on pain of forfeiture of the lease.[26] Thus, even when encouraging the "orderly economic development of domestic mineral resources," federal law requires Interior to ensure that valuable public resources are not wasted. Indeed, the word "orderly" itself conveys a congressional desire for careful, rational management of America's valuable energy resources.

Read together, the Federal Land Policy and Management Act and Mineral Leasing Act instruct Interior to harmonize the need for domestic mineral production with long-term environmental protection and stewardship of public lands.

The Offshore Dual Mandate

The congressional statement of policy in the Outer Continental Shelf Lands Act declares that the Outer Continental Shelf is a vital natural resource held in trust by the federal government for the benefit of the American people.[27] It details Interior's dual mandate to conduct expeditious and efficient leasing while also protecting the environment and

Photo by Whit Welles

other uses of our nation's waters, including fishing and commercial shipping.[28] The Outer Continental Shelf Lands Act Amendments of 1978 state that one of the purposes of the Act is to "make such resource[s] available to meet the Nation's energy needs as rapidly as possible."[29] Another equally important purpose is to "encourage development of new and improved technology for energy resource production which will eliminate or minimize risk of damage to the human, marine, and coastal environments."[30]

Section 18 of the Outer Continental Shelf Lands Act requires Interior to prepare and periodically revise a Program "indicating, as precisely as possible, the size, timing, and location of leasing activity" on the Outer Continental Shelf over the pertinent five-year program period.[31] The Act directs that management of the Outer Continental Shelf shall be "conducted in a manner which considers economic, social, and environmental values of the renewable and non-renewable resources contained in the outer continental shelf, and the potential impact of oil and gas exploration on other resource values of the outer continental shelf and the marine, coastal, and human environments."[32] Congress further directed the Secretary of the Interior to "select the timing and location of leasing, to the maximum extent practicable, so as to obtain a proper balance between the potential for environmental damage, the potential for the discovery of oil and gas, and the potential for adverse impact on the coastal zone."[33]

The Outer Continental Shelf Lands Act, then, much like the Federal Land Policy and Management Act, strongly emphasizes the need to balance energy production with environmental protection.

Federal Law Requires that Interior Receive Fair Market Value for the Rights It Conveys.

The Fair Market Value Requirement for Onshore Energy Production

The Federal Land Policy and Management Act requires that the United States "receive fair market value of the use of the public lands and their resources unless otherwise provided for by statute."[34] The term "fair market value" is not defined in the statute itself. In 1982—the last time that Interior convened a working group to comprehensively review its "fair market value" procedures—the task force determined that "fair market value" was not merely the value of the oil or gas discovered or produced, but the value of "the right" to explore and, if there is a discovery, to develop and produce the energy resource.[35] Indeed, the statute refers not just to the value of the resources, but also to the value of using the lands.

The Mineral Leasing Act was enacted in 1920 to promote the orderly development of mineral resources and to provide Interior with the authority to determine where and when oil, gas, and coal leases would be issued.[36] The Mineral Leasing Act does not contain an explicit "fair market value" requirement. However, it states that the Secretary of the Interior can include coal, oil, or gas lease terms that she or he deems necessary "to insure the sale of the production of such leased lands to the United States and to the public at reasonable prices, for the protection of the interests of the United States, for the prevention of monopoly, and for the safeguarding of the public welfare."[37]

Fair market value is defined in BLM's economic valuation handbook as "the amount in cash, or on terms reasonably equivalent to cash, for which, in all probability, the property would be sold by a knowledgeable owner willing but not obligated to sell to a knowledgeable purchaser who desired but is not obligated to buy."[38] Fair market value, then, is a somewhat subjective assessment that should be understood within the broader context and goals of the Federal Land Policy and Management Act and Mineral Leasing Act.

The Fair Market Value Requirement for Offshore Energy Production

The Outer Continental Shelf Lands Act requires that "[l]easing activities. . . be conducted to assure receipt of fair market value for the lands leased and the rights conveyed by the Federal Government."[39] While the Act does not provide a definition of "fair market value," the statute refers to the value of the lands and the rights pertaining thereto, rather than simply the resources to be extracted.

BOEM's regulation and enforcement manual describes its fair market value process and bid adequacy procedures as intending to "ensur[e] the public receives a fair return for OCS oil and gas leases."[40] Fair market value is defined in BOEM's manual identically to the description in BLM's handbook: "the amount in cash, or on terms reasonably equivalent to cash, for which, in all probability, the property would be sold by a knowledgeable owner willing but not obligated to sell to a knowledgeable purchaser who desired but is not obligated to buy."[41]

BOEM also uses specific criteria designed to provide adequate returns to the public for the rights issued. BOEM states that "[t]he assurance of FMV [fair market value] is a multi-phase process including national Program-level analysis, lease sale-level analysis, and, finally, analysis done before the issuance of an individual lease following a lease sale."[42] At the Program development stage, BOEM uses a "hurdle price analysis" to filter out program areas where de-

laying a sale may provide greater future economic value.[43] Following size, timing, and location decisions formulated at the Program development stages, BOEM assesses other fair market value components—such as bidding systems and fiscal and lease terms—at the lease sale stage to safeguard against leases being awarded for less than fair market value.[44]

In its most recent 2017 to 2022 Draft Proposed Program for Outer Continental Shelf oil and gas leasing, BOEM also recognized that option value can be an element of the fair market value of a lease.[45] Option value is the value of waiting to make an irreversible decision until critical new information arrives. One well-known example is stock options, which are valuable because they grant their holder the time to learn more about future stock prices before deciding whether to buy or sell. Uncertainty around future energy prices similarly creates option value, as does the uncertainty around extraction costs, such as whether technological developments may, in the future, reduce the environmental risks of oil spills. As part of its decision on size, timing, and location, BOEM acknowledged that it should consider the state of available environmental and social cost uncertainties, as well as resource price, technology, and regulatory uncertainties.[46]

As discussed in Part II, Interior should account for option value and externalities when pricing leases; this would best effectuate the dual mandates of the Federal Land Policy and Management Act and the Outer Continental Shelf Lands Act, and ensure a fair return to the American public.

Interior Has Broad Authority to Set Minimum Bids, Rents, and Royalties.

For onshore oil, gas, and coal exploration and production, the Mineral Leasing Act gives Interior discretion to determine where and when to issue leases.[47] If Interior determines that federal land is suitable for leasing, the Act establishes certain terms that all leases must contain, including bid, rental, and royalty provisions.[48] Congress granted Interior broad authority to "prescribe necessary and proper rules and regulations and to do any and all things necessary to carry out and accomplish the purposes of" the Mineral Leasing Act.[49] Pursuant to this authority, the Secretary of the Interior has promulgated regulations for onshore oil, gas, and coal leases.[50]

For offshore oil and gas exploration and production, the Outer Continental Shelf Lands Act grants Interior the power to determine where and when oil and gas leases will be issued. The Secretary of the Interior must prepare a five-year program consisting of a schedule of oil and gas lease sales indicating the size, timing, and location of proposed leasing activity that the Secretary determines will best meet national energy needs.[51] Preparing a five-year program involves extensive public comment and requires the Secretary to balance the potential for the discovery of oil and natural gas, the potential for environmental damage, and the potential for adverse effects on the coastal zone.[52] There is an additional public process for each lease sale to determine whether to hold the lease sale, and what terms and conditions will apply to those leases.

The fiscal components of the federal leasing program primarily consist of three terms defined in each lease: bids (also called "bonus payments"), annual rental payments ("rents"), and royalties. Total revenue from federal onshore production is divided evenly between the federal government and each state in which the production takes place (to account for administrative costs, the federal government receives 52 percent and each state receives 48 percent).[53] For offshore production, federal Outer Continental Shelf land ownership begins three nautical miles off the coast; the

coastal state closest to federal offshore production receives 27 percent of revenues from leases in an area extending up to six miles off its coast.[54] Gulf-producing states (defined as Alabama, Mississippi, Louisiana, and Texas) receive up to 37 percent of revenues from certain Outer Continental Shelf Gulf leases.[55] Coastal states have advocated for greater revenue share due to impacts on coastal infrastructure and the environment.[56]

Federal leases must provide the American people with fair and adequate compensation for the rights surrendered and the resources extracted.[57] The remainder of this Part describes Interior's authority to set minimum bids, rents, and royalties at an amount that ensures receipt of fair market value. However, as Part II discusses in more detail, because Interior excludes many environmental and social considerations when setting each term, federal leases are currently undervalued.

Authority to Set Bids

Interior, through BLM, allocates onshore oil and gas leases for a primary term of ten years through a competitive bidding process.[58] Interested parties may nominate tracts for leasing, and tracts are then offered for leasing through an oral auction. Each bidder offers a fixed amount as an initial bid. A bid is a one-time payment made to the federal government by the lessee at the time oil, gas, or coal leases are granted. The bidder that makes the highest bid is awarded the lease, provided that the bid amount exceeds a set "minimum." If a qualified bid is not received for any tracts offered at a competitive auction, those leases are offered noncompetitively, for the minimum bid price. [59]

The Mineral Leasing Act, as amended, gives the Secretary of Interior authority to set the national minimum bid for onshore oil and gas leases at $2 per acre or greater.[60] The Secretary of Interior may "establish by regulation a higher national minimum acceptable bid for all leases based upon a finding that such action is necessary: (i) to enhance financial returns to the United States; and (ii) to promote more efficient management of oil and gas resources on Federal lands."[61]

Photo by Bureau of Land Management

However, Interior has allowed the minimum bid for onshore oil and gas to remain at $2 per acre for decades.[62] The Mineral Leasing Act prohibits BLM from setting minimum bids on a tract-by-tract basis. It states that "[t]he Secretary [must] accept the highest bid . . . which is equal to or greater than the national minimum acceptable bid, without evaluation of the value of the lands proposed for lease."[63] Thus, while the Secretary of the Interior has the authority to raise the national minimum bid, BLM cannot require higher minimum bids for specific leases.[64] All leases offered at auction that do not receive any bids are offered the following day in a noncompetitive sale for the minimum bid price.[65] In the aggregate, about 40 percent of existing onshore leases were issued non-competitively. In 2014, about 10 percent of new leases were issued non-competitively.[66]

For coal leases, the Mineral Leasing Act states that "[n]o bid shall be accepted which is *less than the fair market value*, as determined by the Secretary, of the coal subject to the lease."[67] The minimum bid for a coal lease is currently set at $100 per acre.[68] Before each lease sale, BLM formulates an estimate of the "fair market value" of the coal lease offered. BLM's fair market value calculation is confidential and is only used to evaluate the bids received during the sale.[69] BLM accepts sealed bids prior to the date of the sale. The winning bid is the highest bid that meets or exceeds the coal tract's presale estimated fair market value.[70]

The bidding and allocation process for offshore oil and gas leases is similar to that for coal. BOEM first solicits nominations of tracts for leasing.[71] Leases are allocated through a competitive bidding process, with interested parties submitting sealed bids.[72] For offshore leases, the Secretary of the Interior "is authorized to grant [the lease] to the highest responsible qualified bidder or bidders by competitive bidding."[73] To ensure that the government receives a fair return for these offshore lease rights, BOEM uses an evaluation process to assess bid adequacy.

Both BOEM and BLM (for onshore coal leases) primarily rely on two approaches to measure fair market value of their leases: the comparable approach and the net income approach.[74] The first approach uses comparable lease sales and uses prior bids paid in similar mineral rights transaction.[75] The second approach uses projected revenue from the resource over time, under realistic conditions.[76] This bid adequacy process relies on evidence of market competition, as well as in-house estimates of tract value.[77]

However, as discussed in Part II, below, these two approaches to measuring a fair return do not properly account for the option value associated with federal leasing. And because many leases are uncompetitive, with only one qualified bidder, relying on comparable lease sales may simply perpetuate a pattern of accepting improperly low bids.

Authority to Set Rents

Pursuant to the Mineral Leasing Act, a company holding an onshore oil or natural gas lease on public land, but not currently producing and paying royalties from production on that land, must pay the federal government an annual rental fee of at least $1.50 per acre, during the first five years, and at least $2 per acre each year thereafter.[78] When resource production begins, this rental requirement converts to a minimum royalty.[79] The Secretary of the Interior has the authority to establish a higher minimum rate.[80] Current BLM regulations set annual rents at the statutory minimum rate. BLM cannot require higher rents on a lease-by-lease basis unless this regulation is revised.[81] BLM has not increased the rental rates since they were last revised in 1987. The Mineral Leasing Act of 1920 originally established a rental rate of not less than $1 per acre, per year, for most oil and gas leases.

For coal, the statutory minimum rent is $3 per acre, per year; Interior has authority to charge a higher rent.[82] By the terms of its regulation, BLM also has the power to specify "the amount of the rental . . . in the lease."[83] This gives BLM greater flexibility to adjust rental rates for coal leases than it currently has for onshore oil and gas leases.

For offshore leases, the Outer Continental Shelf Lands Act grants the Secretary of the Interior discretionary authority to set rents for individual leases.[84] BOEM has been delegated this authority by the Secretary, and can set rents on a lease-by-lease basis.[85] BOEM commonly uses escalating rental rates to encourage faster exploration and development of leases, and earlier relinquishment when exploration is unlikely to be undertaken by the current lessee.[86] BOEM states that rental payments "serve to discourage lessees from purchasing marginally valued tracts too soon because companies will be hesitant to pay the annual holding cost to keep a low-valued or currently uneconomic lease in their inventory."[87]

Authority to Set Royalty Rates

When a lessee successfully extracts mineral resources from federal land, the federal government is entitled to a royalty on the production. Royalties account for approximately 80 percent of all federal revenue from federal oil, gas, and coal leasing.[88] The royalty rate is a percentage of the value of production; the royalty owed is the volume of production, times the unit value of production, times the royalty rate.

The Mineral Leasing Act of 1920 sets a floor for onshore oil and natural gas royalty rates at no less than 12.5 percent of the value of production.[89] Although Interior is authorized by statute to set a higher rate than 12.5 percent for competitive leases, BLM's existing regulations set a flat rate of 12.5 percent for such leases.[90] For non-competitive leases, the royalty rate is fixed by statute at 12.5 percent.[91]

Photo by D Ramey Logan

The Mineral Leasing Act and the Federal Coal Leasing Amendments Act of 1976 set a royalty rate floor for coal production at 12.5 percent of the gross value of the coal produced from surface mines, and 8 percent for coal produced from underground mines.[92] The Mineral Leasing Act's coal royalty provision states that, "[t]he lease shall include such other terms and conditions as the Secretary shall determine."[93]

The Secretary of the Interior has the authority to increase the current royalty rates for oil, gas, and coal. Any new royalty rate would be applied to new leases and leases renewed in the future; leases currently in production are subject to renewal after the first 20 years of production, and every 10 years thereafter.[94]

With respect to offshore oil and gas leases, the Outer Continental Shelf Lands Act states that Interior must set royalties at or above 12.5 percent.[95] Interior is permitted to set a higher royalty rate.[96] If Interior raises royalty rates for offshore production, Congress can pass a resolution disapproving this change within 30 days of Interior's action.[97] In 2007, Interior increased the royalty rate for new offshore leases in the Gulf of Mexico from 12.5 percent to 18.75 percent.[98] Interior made this change in response to advances in production technology, increased oil and gas prices, and the competitive market for offshore leases.[99] Interior estimated that the royalty rate increase from 12.5 percent to 18.75 percent would increase oil and gas revenues by $8.8 billion over the next 30 years.[100] The royalty rate for Outer Continental Shelf areas off the Alaskan coast, as well as other frontier areas, remains 12.5 percent.

As the following section describes, Interior can use its authority to increase minimum bids, rents, and royalty rates based on option value and the consideration of environmental and social costs that will result from exploration and production. In any legal challenge, Interior's determination to adjust these fiscal terms would be subject to an arbitrary and capricious standard.[101] Interior's decision would likely be entitled to significant deference, as it has particular expertise in the stewardship and valuation of federal natural resources.[102]

Part II: Interior Should Revise the Fiscal Terms for Federal Leases to Provide a Fair Return to the Public and Effectuate its Dual Mandate

The current federal leasing system fails to provide a fair return to the public. By excluding relevant environmental and social costs from the fiscal terms of leases, Interior fails to collect a fair market value for taxpayers and fails to adequately preserve federal environmental resources. In line with its statutory mandates under the Federal Land Policy and Management Act, Mineral Leasing Act, and Outer Continental Shelf Lands Act, Interior should:

- Secure a fair return for the American people by incorporating economic, environmental, and social option value into minimum bids for coal, oil, and natural gas leases;
- Raise annual rents to account for the foreseeable externalities associated with exploration and resource development; and
- Increase royalty rates to reflect environmental and social costs that result from production, and eliminate royalty relief provisions that provide improper incentives to energy companies.

Interior can secure a fair return for American taxpayers by incorporating option value into the minimum bid price for coal, oil, and natural gas leases.

Option value derives from the ability to delay decisions until later, when more information is available. The concept's most familiar application is in the financial markets, where investors calculate the value of options to wait for more information on stock prices before deciding whether to buy or sell shares (i.e., stock options). A conceptually identical and well-established methodology exists to quantify the value of waiting to gain greater information about environmental, social, economic, and technological uncertainties.[103] In the leasing context, the value associated with the option to delay can be large, especially when there is a high degree of uncertainty about resource price, extraction costs, and/or the social and environmental costs of drilling. Accounting for option value does not always require that the government postpone issuing leases; rather, it requires that the government is adequately compensated for the value of delay.

Interior currently fails to account for option value in setting minimum bids for natural resources leases. The minimum bid should be set at a level to ensure a fair return for U.S. taxpayers on parcels acquired by private companies. Accounting for economic, environmental, and social option value would very likely increase the minimum bid price above the current statutory minimums for oil, gas, and coal. Therefore, to ensure a fair return, Interior should raise national minimum bids to account for the full value of this option.

The federal government holds a perpetual option to develop energy resources, yet this option value is not accounted for in minimum bids.

The importance of option value to evaluating decisions under uncertainty has been widely recognized in the economics community for several decades.[104] The option value framework has long been applied to natural resource extraction decisions, including offshore oil drilling. In fact, the petroleum industry routinely accounts for the value of waiting for more information on uncertain future oil prices and production costs, which explains the frequent practice of companies purchasing offshore leases but waiting long periods of time to begin drilling.[105] A 2011 Interior report estimated that about 70 percent of offshore leases and 57 percent of onshore leases were not under any active or planned development.[106]

Option value is relevant for both price uncertainty, as well as environmental and social uncertainty. Interior's current minimum bids fail to account for the option value associated with each of these categories of uncertainty.

First, with respect to price uncertainty, Interior holds—on behalf of the American public—perpetual options to develop or lease oil, gas, and coal tracts; the agency must decide when and where exercising those options will be most opportune. When Interior sells a lease, the federal government's perpetual option is converted to time-limited option held by the lessee, lasting for the duration of the lease. The lessee must act within a set time period—between five and ten years for both onshore and offshore leases[107]—or it will lose the right to develop the tract. A perpetual option is more valuable than a time-limited option, as it gives the option holder the power to wait, indefinitely, for more information (or for prices to rise) before making an irreversible decision. Thus, when the federal government sells a private lessee the right to develop a tract for a set period of time, it extinguishes the perpetual option that the government holds on behalf of the American people, and sells a time-limited option. Interior does not account for the lost value of its perpetual option in the price of its leases.[108] As a result, the public does not receive the full value of the right to exploit its resources.

Photo by Mike Quinn

BOEM currently uses a "hurdle price analysis" at the program stage that is designed to account for some resource price uncertainty;[109] however, it does not conduct similar analysis at the lease sale stage, and also fails to account for environmental and social uncertainties in this analysis. BLM does not use a "hurdle price" analysis for any of its lease sales. Rather, BLM uses the $2 per acre minimum bid for all oil and gas leases, thus failing to account for price uncertainty in these minimum bids altogether.[110]

Second, Interior fails to account for environmental and social uncertainty when evaluating tracts to offer at auction, as well as when setting minimum bids and assessing fair market value. The environmental, social, and economic uncertainties associated with drilling and mining are many, and include:

- Uncertainty about the magnitude of risk of catastrophic oil spills, especially in relatively dangerous or unfamiliar areas like deep-water zones and the Arctic;
- Uncertainty about the development rate of spill-prevention, spill-remediation, and pollution-prevention technologies, as well as technologies that may better protect worker safety;
- Uncertainty about competing uses of federally-leased areas, such as the potential for renewable energy projects; and
- Sensitivities to threats associated with drilling and mining, such as the toxicity of spills or leaks, climate and marine conditions that may exacerbate the damaging effects of spills, and consequences for land values near spills and production sites.

These uncertainties can and should be accounted for when evaluating which parcels to offer for leasing, as well as when setting minimum bids and evaluating bid adequacy. The option value associated with each of these uncertainties, among others, is a component of the "fair market value" of the right to develop public resources.[111]

Lack of Robust Competition for Onshore Leases Underscores the Need to Raise Minimum Bids

Some concerns with respect to low minimum bids would logically be tempered in a truly competitive market, with multiple bidders. However, the majority of coal lease sales conducted by BLM are uncontested, with no bidders other than the initial applicant that nominated the tract.[112] This lack of robust competition means that many coal leases are sold for the statutorily-set minimum bid of $100 per acre, even though BLM has the power to require higher minimum bids on a lease-by-lease basis.[113] And for onshore oil and gas, about 40 percent of leases currently in force were offered noncompetitively, for the minimum bid of $2 per acre.[114] The non-competitive nature of many federal onshore lease sales all but guarantees that the full value of the government option is not captured in the bid price. Moreover, while robust competition might ensure that bidders account for some amount of price uncertainty, private actors do not have an incentive to account for environmental and social uncertainty, as they do not internalize the full cost of pollution or impairment of competing uses of the land. These effects are externalities, many of which do not rise to the level of legally actionable claims, or which would require costly and time-consuming litigation to recoup.

At the lease sale stage, BLM and BOEM have information about specific risks and environmental, social, and economic uncertainties relevant to the leases at issue. The agencies should account for this option value in order to earn

a fair return and to avoid unnecessarily exposing the public to high-risk drilling. For example, where uncertainties are high, such as in more remote or extreme weather environments, as in the Arctic, the value of delay is greater. Thus, when done correctly, adjusting minimum bids to account for option value would help ensure that the government only leases when and where the present societal benefits outweigh the costs, including the value of delay.

In short, Interior should increase minimum bids in order to recoup the option value associated with leasing federal resources.

Both BOEM and the D.C. Circuit Court of Appeals recognize the relevance of option value to federal natural resources management.

In a deliberate move towards greater rationality, BOEM recently recognized the utility of option value in its proposed offshore leasing plan for 2017 to 2022. Specifically, BOEM noted that: (i) environmental and social cost uncertainties can affect the size, timing, and location of offshore leasing; (ii) option value can be a component of the fair market value of a lease; and (iii) BOEM can raise minimum bids, rents, and royalties for leases to account for option value.[115] However, BOEM declined to quantify environmental option value, and instead only qualitatively addressed option value in its 2017-2022 draft program.[116]

In addition, the United States Court of Appeals for the D.C. Circuit recently affirmed the existence and validity of option value with respect to offshore oil and gas drilling. In *Center for Sustainable Economy v. Jewell*, Petitioner argued that OCLSA Section 18 required BOEM to explicitly consider and quantify the option value of delaying leasing in specific regions of the Outer Continental Shelf.[117] The Court's decision recognized the utility of option value to Interior's offshore leasing program:

> More is learned with the passage of time: Technology improves. Drilling becomes cheaper, safer, and less environmentally damaging. Better tanker technology renders oil tanker spills less likely and less damaging. The true costs of tapping OCS energy resources are better understood as more becomes known about the damaging effects of fossil fuel pollutants. Development of energy efficiencies and renewable energy sources reduces the need to rely on fossil fuels. As safer techniques and more effective technologies continue to be developed, the costs associated with drilling decline. *There is therefore a tangible present economic benefit to delaying the decision to drill for fossil fuels to preserve the opportunity to see what new technologies develop and what new information comes to light.*[118]

Ultimately, the Court found that BOEM's failure to quantify option value in its 2012-2017 Program was not arbitrary or irrational at this time because the methodology for quantifying option value is not yet "sufficiently established."[119] But importantly, the Court's holding indicates that quantitative methods might be developed in the future, and that such methods would be preferable to qualitative treatment of option value.[120] The court noted: "Had the path been well worn, it might have been irrational for Interior not to follow it."[121] While the decision addressed offshore leasing, the Court's language on the utility of option value is equally applicable to both onshore and offshore leasing. And BLM, unlike BOEM, currently fails to address environmental and social option value in any manner, qualitatively or quantitatively.

RECOMMENDATIONS:
Interior should raise minimum bids to account for option value, and evaluate methods to quantify option value for both offshore and onshore leasing.

First and foremost, Interior should evaluate how to incorporate option value into minimum bids for oil, gas, and coal leases, both onshore and offshore. Interior has the authority, pursuant to the Mineral Leasing Act and the Outer Continental Shelf Lands Act, to increase minimum bids. It can and should evaluate what level of bid increase is necessary in order to account for the value of the government's perpetual option for natural resources leasing. Interior has allowed the minimum bid for onshore oil and gas to remain at $2 per acre for decades.

Second, BOEM currently evinces a more sophisticated understanding and application of option value than BLM, as detailed in its latest draft program for offshore leasing. Interior should take steps to ensure that BLM catches up with BOEM's valuation methods and understanding of option value. Further, BLM should review and adopt BOEM's language on the utility of option value to both its program-level and lease sale decisions.[122] As the D.C. Circuit affirmed, there is "a tangible present economic benefit to delaying the decision to drill," and failing to account for this value undervalues public resources.[123]

Third, Interior should revise its regulations to encourage or require BLM and BOEM to account for option value when setting lease-specific minimum bids for coal leases and offshore oil and gas leases.[124] Consistent with the D.C. Circuit's opinion in *CSE v. Jewell*, and as BOEM directly articulated, option value can be a component of the fair market value of a lease. BLM and BOEM should also update their handbooks and guidance manuals to require the consideration of option value when setting fiscal terms of leases. For example, a "social hurdle price" could be calculated for each lease sale, or subsection of tracts in a lease sale, in order to account for environmental, social, and economic uncertainty.

Photo by Daniel Foster

Fourth, Interior should consider organizing a working group to evaluate methods to use and quantify option value for both offshore and onshore leasing.[125] Government agencies play an important role in quantifying new categories of costs and benefits.[126] Indeed, the D.C. Circuit ruling strongly suggests that academic advancements in option value research could soon compel BOEM and BLM to quantify the option value associated with their leasing practices; the agencies should lead this effort now. While developing such a methodology will have a discrete upfront cost, once created, this model could be used and refined in future government natural resources leasing decisions, and could earn the American public billions of dollars in net benefits from more optimal timing, location, and lease terms, as well as avoided catastrophic oil spills and other costs of high-risk drilling.

In short, the initial investment required to quantify the option value associated with offshore leasing may be vastly outweighed by the long-term societal benefits. Such an approach would also be consistent with the Federal Land Policy and Management Act's dual mandate and the Outer Continental Shelf Lands Act's direction to weigh "economic, social, and environmental values."[127]

Interior should ensure that rents incorporate the environmental and social externalities of exploration and resource development.

Interior has discretion to set oil, gas, and coal lease rental rates at an appropriate level, yet often charges no more than the statutory minimums. Accounting for the full lost value of the public's use and enjoyment of federal lands during the rental period, as well as the anticipated externalities associated with exploratory drilling would likely raise the rent price above the current statutory minimums. BLM's rental rates of $1.50 or $2 per acre were last updated in 1987, and are lower than the rental rates charged by other oil and gas-producing states, such as Texas (which charges $5 per acre during the first three years, and $25 per acre thereafter if the lease still has no production).[128] Interior should consider raising minimum rental rates in order to receive fair market value for the rights it conveys.

Energy leaseholders impose uncompensated costs on the public as soon as exploration begins.

America's public lands offer millions of people a place to hike, camp, hunt, fish, and enjoy scenic beauty. They provide drinking water, clean air, critical habitat for wildlife, sites for renewable energy development, as well as natural resources including timber, minerals, oil, and natural gas. As soon as energy exploration begins, competing uses of federal land such as recreational enjoyment, commercial fishing, and renewable energy development are impaired, and continue to be foreclosed for the duration of production.

Energy companies also cause environmental and noise pollution through prospecting, exploratory drilling, and other activities undertaken in preparation for resource extraction. Often, companies do not pay for the full cost of this damage, because these negative effects are externalities, many of which do not rise to the level of actionable legal claims, or which would entail complex and costly litigation to establish causation or damages. During exploration, operators drill test wells and may use dynamite find minerals. Operators construct roads to and from the exploration site and build production facilities. Beginning with exploration, increased vehicular traffic due to drilling and mining operations contributes to wear and tear on roadways, as well as traffic-related fatalities. For example, a 2014 *Houston*

Chronicle investigation found a 50 percent increase in motor vehicle fatalities in the West Texas counties associated with the Permian Basin, and an 11 percent increase in Eagle Ford Basin and Barnett Shale counties.[129]

Neither BLM nor BOEM presently attempt to quantify these costs or charge lessees for them. As a result, energy companies may conduct more prospecting operations than are socially optimal, because they do not bear all of the costs of this damage. Because many of these externalities occur before resources are extracted, yet after leases begin, these costs are logically recoverable at the rent stage. A socially efficient rent price would fully compensate the public for these costs.[130]

RECOMMENDATION:
Interior should increase rents charged to account for impairment of recreational interests and environmental and social externalities.

First, the Secretary Interior has the authority to establish a higher minimum rental rate for oil, gas, and coal leases. To earn fair market value for the rights conveyed, Interior should raise the minimum rent price to account for the foreseeable externalities associated with holding leases, prospecting, and conducting exploratory drilling and mining.[131]

Second, because it has the authority to adjust rents for individual coal and offshore leases, Interior should use environmental impact statements or environmental assessments (required pursuant to the National Environmental Policy Act ("NEPA")), as well as company-provided exploration plans, to estimate the externalities associated with particular lease sales. Interior should charge higher rental rates for leases that are expected to result in greater local air pollution, commercial vehicle traffic, seismic exploration, drilling, or other anticipated externalities during the rental period.

Third, current BLM regulations set annual rents for onshore oil and gas leases at the level of the statutory minimums: $1.50 per acre for the first five years, and $2 per acre thereafter.[132] BLM cannot require higher rents on a lease-by-lease basis for oil or natural gas tracts unless this regulation is revised.[133] Interior should initiate a rulemaking to provide BLM with the flexibility to adjust rents upwards in any future lease, to account for environmental externalities, foregone recreational use, or other factors.

Finally, Interior should attempt to quantify the recreational utility of given tracts of land, and account for this in the rent price. Some lease sites may have greater recreational value than others; this value should be accounted for in setting the rental rate. BLM and BOEM might use data on visitor history to particular regions or lease sites to help assess this social cost of leasing. The Federal Land Policy and Management Act, Mineral Leasing Act, and Outer Continental Shelf Lands Act require receipt of fair market value for the rights conveyed; this should include the value of the right to temporarily restrict or permanently impair recreational use.

Interior should increase royalty rates to account for environmental and social costs that result from production.

Energy companies currently benefit from inefficiently low royalty rates, because Interior's rates do not account for environmental and social impacts. Underscoring the need for comprehensive reevaluation, onshore royalty rates for oil and natural gas have not increased in nearly 100 years, even as U.S. oil and gas producers have benefitted from rapid technological innovation, political stability, and relatively high resources prices—many of the same factors that led to an increase in offshore royalty rates in 2007.[134]

The royalty rates paid by energy companies do not compensate the federal government for the social and environmental costs of resource extraction.

During gas, oil, and coal production, drilling and mining cause local and global air pollution. For example, the United States loses at least 1 to 3 percent of its total natural gas production each year when methane is leaked, flared (burned), or vented to the atmosphere during the production, processing, transmission, storage, and distribution of natural gas and oil.[135] This is a waste of a valuable resource—contrary to the goals of the Mineral Leasing Act to avoid all "undue waste"—as well as a potent source of greenhouse gas pollution.[136] Further, air quality near well sites can reach ozone levels that fail to meet EPA standards.[137] Injection wells used to dispose hydraulic fracturing wastewater can induce earthquakes.[138] And wastewater stored in pits and tanks has the potential to leak, causing water contamination.[139]

These concerns are not always adequately addressed through tort or environmental law. Fines and tort liability may address only major violations; even then, the harm will have already taken place. Further, what relief is available may entail costly and time-consuming litigation, where plaintiffs bear the burden of proving a violation.[140] Further, even if successful, plaintiffs may ultimately recover less than the total value of the damage.[141]

Bonding Requirements

Interior's bonding requirements are outdated and may be insufficient to cover the full cost of accidents or damage that occurs after production. Companies must pay bonds to BLM, pursuant to the Mineral Leasing Act, in order to ensure that they can perform reclamation of any federal land that may be disturbed by fossil fuel production. BLM's bond amounts were set in the 1950s and 1960s, and may be too low to ensure that companies can perform all necessary reclamation.[142] If a bond is not sufficient to cover well plugging and surface reclamation and there are no responsible or liable parties, the well is considered "orphaned," and BLM must use federal dollars to fund reclamation. Interior should review bonding requirements and revise them if necessary to ensure that reclamation costs are paid by responsible parties.

Outdated royalty valuation processes also reveal the need for reform.

Surveys of state and foreign government royalty rates also suggest that Interior does not set royalty rates in a manner that guarantees a fair return to the American people.[143] Most energy-rich states in the United States set royalty rates for fossil fuel production between 15 and 20 percent; Texas has a 25 percent rate for oil and gas production.[144] A 2008

Government Accountability Office report found that the United States receives one of the lowest overall "takes" worldwide for oil, gas, and coal leases.[145] This is so, even as the United States is a very attractive place for companies to do business given its longstanding political stability, abundant oil and natural gas reserves, and ample existing infrastructure, including oil rigs, refineries, pipelines, and railways.[146]

Royalty Rates for Oil and Gas Produced on Federal and States Lands (as of June 2015)

JURISDICTION	ROYALTY RATE	AUTHORITY
Federal onshore	12.5%	30 U.S.C. § 226(b)(1)(A); 43 C.F.R. § 3103.3–1(a)(1)
Federal offshore	18.75% for Gulf of Mexico; 12.5% for other offshore leases	43 U.S.C. § 1337(a); Department of the Interior notices
California	16.67%, minimum	Cal. Pub. Res. Code § 6827
Colorado	16.67%	Colo. Oil and Gas Dev. Policy No. 500-001
New Mexico	18.75% for development leases; 16.67% for discovery leases	N.M. Stat. Ann. §§ 19-10-4.1; 19-10-4.3
North Dakota	16.67% or 18.75% depending on the county	N.D. Cent. Code §§ 15–05–09; 15–05-10
Pennsylvania	12.5%	Penn. P.L. 183, No. 60, § 1
Texas	20 to 25%	Tex. Nat. Res. Code Ann. §§ 52.022; 52.024; 32.1073

A 2013 Government Accountability Office report also criticized Interior's lack of documented procedures for determining how it sets royalty rates for new offshore leases.[147] The report points to the 2007 changes made by Interior to increase the royalty rate for new offshore leases in the Gulf of Mexico. Interior estimated that the royalty rate increase from 12.5 percent to 18.75 percent would increase oil and gas revenues by $8.8 billion over the next 30 years.[148] However, Interior did not comprehensively evaluate the entire federal oil and gas system, and therefore left onshore royalty rates unchanged, and did not produce written documentation of its analysis nor the specific rationale for the increase.

In addition, when calculating royalties owed to the government, Interior's Office of Natural Resources Revenue has been criticized for failing to account for higher export prices, especially for coal.[149] Companies may engage in "faux" arm's length transactions, for example, by selling coal to an affiliate which then sells the coal for a higher price overseas. Such companies then report only the initial domestic sale price to the agency, which uses that (lower) price to calculate the royalties due.[150] To ensure a fair return, Interior should establish procedures to verify arm's-length transactions and curtail any improper gaming of the system. The Office of Natural Resources Revenue's proposed rule, released in January 2015, would clarify the definition of arm's-length transactions and give the agency more authority to police this practice.[151]

RECOMMENDATION:
Interior should increase royalty rates to reflect environmental and social costs that result from production, and modernize antiquated royalty relief provisions.

First, Interior should comprehensively review onshore and offshore royalty rates at the same time, in order to assess how an increase in royalty rates might affect overall returns and better meet the mandates of the Federal Land Policy and Management Act, Mineral Leasing Act, and Outer Continental Shelf Lands Act. Onshore royalty rates are due for an increase, and many of the factors that led Interior to update its offshore royalty rates in 2007 have been present in the onshore market for nearly as long, such as technological advancement, political stability, and relatively high resource prices.

Second, Interior should consider increasing minimum royalty rates above current levels to account for foreseeable environmental and social costs of production. For all leases obtained competitively, BLM and BOEM are permitted to negotiate royalty rates with energy leaseholders on a lease-by-lease basis; however, most federal onshore and offshore leases are set at or near the statutorily prescribed minimum: 12.5 percent for onshore oil, gas and surface coal production, and 18.75 for offshore oil and gas in the Gulf of Mexico.[152]

A minimum royalty rate that would assure a fair return to the public should account for: (1) negative externalities imposed on the local environment and communities, (2) infrastructure demand (e.g., water, power, roadways, processing facilities, and pipelines); and (3) any foreseeable "waste" of the resource, such as vented or flared methane (which is primarily composed of natural gas) associated with natural gas, oil, and coal production.[153] For example,

Photo of the Department of the Interior by Matthew Bisanz

a royalty rate adjustment to account for anticipated vented or flared methane may be particularly appropriate, as the Mineral Leasing Act requires oil and gas lessees to "use all reasonable precautions to prevent waste of oil or gas developed in the land."[154]

Third, for individual leases, BOEM and BLM should assess foreseeable environmental and social costs by converting projections found in site-specific assessments and environmental impact statements, required by NEPA, into "externality adjustments" that may raise the royalty rate by a certain percentage.[155] This adjustment could be made on a lease-by-lease basis or for each lease sale, and could account for the type of resource to be extracted, method of production, and type and extent of the anticipated externalities. Relying on NEPA documents would appropriately narrow the agencies' attention to "reasonably foreseeable environmental effects of the action," rather than every conceivable possibility.[156]

Finally, Interior should eliminate existing royalty relief provisions that provide improper incentives to energy companies that run counter to the dual mandates of the Federal Land Policy and Management Act and the Outer Continental Shelf Lands Act. Specifically, Interior's Office of Natural Resources Revenue currently allows companies to subtract transportation and processing costs from the federal royalties they owe, including fuel costs, terminal operator fees, and more.[157] This does not provide proper incentives for companies to locate production closer to refineries or end energy users, nor to use more efficient modes of transportation. More generally, it does not provide incentives for production to be located at a socially optimal place. Therefore, companies may emit more carbon dioxide in transporting oil, gas, and coal than is socially optimal, creating negative externalities. Interior should consider eliminating this royalty relief provision altogether, or strongly limiting its scope. This royalty relief provision runs counter to the explicit aims of the Mineral Leasing Act to prevent waste, and to the Federal Land Policy and Management Act's goal to protect the quality of "air and atmospheric" resources, and to "protect certain public lands in their natural condition."[158]

Conclusion

The fiscal terms of federal oil, gas, and coal leases do not require energy producers to internalize the foreseeable environmental and social costs of fossil fuel extraction. Failing to account for these costs in the terms of federal leases shifts them onto taxpayers, who already receive an improperly low return due to outdated valuation regulations. To ensure that the American public receives a fair return, the Interior should revise its fiscal terms to account for option value and environmental and social externalities. This report's recommendations would help to provide fair market value for the public's natural resources, and harmonize the government's dual mandate of preservation and production.

Endnotes

[1] U.S. Energy Information Administration, International Energy Statistics: Gross Natural Gas Production 2009 to 2010, *available at* http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=3&pid=3&aid=1&cid=regions&syid=2009&eyid=2010&unit=BCF. From 2007 through 2012, monthly crude oil production increased by 39 percent, and monthly natural gas production increased by 25 percent. U.S. Energy Information Administration, Oil and gas industry employment growing much faster than total private sector employment (Aug. 2013), *available at* http://www.eia.gov/todayinenergy/detail.cfm?id=12451.

[2] U.S. Energy Information Administration, Crude Oil Production, *available at* http://www.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbblpd_a.htm (follow to View History: U.S. Production, Annual); U.S. Energy Information Administration, Natural Gas Gross Withdrawals and Production, *available at* http://www.eia.gov/dnav/ng/ng_prod_sum_dcu_NUS_m.htm (follow to View History: U.S. Natural Gas Gross Withdrawals, Annual).

[3] U.S. Energy Information Administration, Annual Energy Outlook 2015 at ES-4 (April 15, 2015), *available at* http://www.eia.gov/forecasts/aeo/pdf/0383(2015).pdf ("In all the AEO2015 cases, the United States transitions from a net importer of 1.3 Tcf of natural gas in 2013 to a net exporter in 2017.") The United States becomes a net petroleum exporter in 2021 in high oil price scenarios. *Id* at ES-3 to ES-4; Figure ES3. In lower oil price scenarios, lower levels of domestic consumption of liquid fuels and higher levels of domestic production of crude oil push the net import share of crude oil and petroleum products supplied down from 33 percent in 2013 to 17 percent in 2040. *Id.* at ES-4; Figure ES4.

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[5] U.S. Gov't Accountability Office, No. GAO-14-238, Oil and Gas: Updated Guidance, Increased Coordination, and Comprehensive Data Could Improve BLM's Management and Oversight 1 (May 2014), *available at* http://www.gao.gov/products/GAO-14-238 .

[6] U.S. Gov't Accountability Office, No. GAO-08-691, Oil and Gas Royalties: The Federal System For Collecting Oil And Gas Revenues Needs Comprehensive Reassessment 7-10 (Sept. 2008), *available at* http://www.gao.gov/products/GAO-08-691.

[7] *Id*; U.S. Gov't Accountability Office, No. GAO-14-50, Actions Needed For Interior, *supra* note 4; U.S. Gov't Accountability Office, No. GAO-07-676R, Oil and Gas Royalties: A Comparison of the Share of Revenue Received from Oil and Gas Production by the Federal Government and Other Resource Owners (May 2007), *available at* http://www.gao.gov/products/GAO-07-676R; *see also* Tom Sanzillo, Institute for Energy Economics & Financial Analysis, *The Great Giveaway: An Analysis of the Costly Failure of Federal Coal Leasing in the Powder River Basin* (2012) (estimating that the federal government lost $28.9 billion in revenues over 30 years due to BLM's failure to receive fair market value for coal mined in the Powder River Basin, which produces 43 percent of the nation's coal); John M. Broder, Undervalued Coal Leases Seen as Costing Taxpayers, N.Y. Times (June 11, 2013); U.S. Department of the Interior, Office of the Inspector General, Evaluation: Coal Management Program (June 2013), *available at* http://www.documentcloud.org/documents/712402-inspector-generals-report-on-coal-leases.html.

[8] Juliet Eilperin, Powder River Basin Coal Leasing Prompts IG, GAO Reviews, Washington Post (June 24, 2012); Brian Grow, Joshua Schneyer, and Janet Roberts, Special Report: Chesapeake and Rival Plotted to Suppress Land Prices, Reuters (June 25, 2012).

[9] *See* Center for Western Priorities, A Renters Market: Outdated Oil & Gas Rental Rates Fail Taxpayers (Aug. 2014), *available at* http://westernpriorities.org/rentersmarket/.

[10] *See* Center for Western Priorities, A Fair Share: The Case For Updating Federal Royalties (June 2013), *available at* http://westernpriorities.org/wp-content/uploads/2013/06/royalties-report.pdf; Headwaters Economics, An Assessment Of U.S. Federal Coal Royalties (Jan. 2013), *available at* http://headwaterseconomics.org/wphw/wp-content/uploads/Report-Coal-Royalty-Valuation.pdf; Law Library of Congress, Global Legal Research Center, Crude Oil Royalty Rates in Selected Countries (Jan. 2015), *available at* http://www.loc.gov/law/help/crude-oil-royalty-rates/crude-oil-royalty-rates.pdf.

[11] Department of the Interior, Bureau of Land Management, Advance Notice of Proposed Rulemaking: Oil and Gas Leasing; Royalty on Production, Rental Payments, Minimum Acceptable Bids, Bonding Requirements, and Civil Penalty Assessments, 80 Fed. Reg. 22148, 22149 (April 21, 2015); Steve Tryon, BLM, *Presentation to the Production Accountants Society of Oklahoma* (Feb. 6, 2013), *available at* http://paso-tulsa.org/wp-content/uploads/2013/02/2-Steve-Tryon-BLM-Presentation-to-PASO.pdf.

[12] Bureau of Ocean and Energy Management, Oil and Gas Leasing on the Outer Continental Shelf, *available at* http://www.boem.gov/uploadedFiles/BOEM/Oil_and_Gas_Energy_Program/Leasing/5BOEMRE_Leasing101.pdf.

[13] U.S. Energy Information Administration, Sales of Fossil Fuels Produced from Federal and Indian Lands, FY 2003 through FY 2012 (June 2014), *available at* http://www.eia.gov/analysis/requests/federallands/pdf/eia-federallandsales.pdf. Coal represented 51 percent of fossil fuel sales from production on federal lands in fiscal year 2013, followed by natural gas (25%) and crude oil (22%). In 2013, coal produced on federal lands accounted for 40 percent of U.S. total coal production; crude oil from federal lands accounted for 23 percent of U.S. production; and natural gas production accounted for 16 percent of total U.S. production. *Id.* at 4. Crude oil royalties accounted for the greatest share of federal revenue, compared to coal and gas. *Id*. The federal Gulf of Mexico produced 69 percent of the federal and Indian lands crude oil total in fiscal year 2013. *See id.* at 1; Table 7.

[14] 43 U.S.C. § 1701(a)(1).

[15] 43 U.S.C. § 1701(a)(8).

[16] *Id.*

[17] 43 U.S.C. § 1701(a)(12).

[18] 43 U.S.C. § 1712(a).

[19] 43 U.S.C. § 1732(a).

[20] 43 U.S.C. § 1712(c)(1).

[21] *Id.* § 1702(c) (" 'Multiple use' means the management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people; . . . the use of some land for less than all of the resources; a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and nonrenewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historical values; and harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment with consideration being given to the relative values of the resources and not necessarily to the combination of uses that will give the greatest economic return or the greatest unit output.").

[22] *Id.*

[23] 43 U.S.C. § 1732(b).

[24] 30 U.S.C § 21(a).

[25] 30 U.S.C. § 187.

[26] 30 U.S.C. § 225. The legislative history of the Mineral Leasing Act and its subsequent amendments reveal that Congress was concerned with the waste of oil and gas. *See Boesche v. Udall*, 373 U.S. 472, 481 (1963) (citing H.R. Rep. No. 398, 66th Cong., 1st Sess. 12-13; H.R. Rep. No. 1138, 65th Cong., 3d Sess. 19; H.R. Rep. No. 206, 65th Cong., 2d Sess. 5) ("The committee reports reveal that one of the main congressional concerns was the prevention of an overly rapid consumption of oil resources that the Government, particularly the Navy,

might need in the future … Conservation through control was the dominant theme of the debates … .The legislation provided for herein, it is thought, will go a long way toward reserve[ing] to the Government the right to supervise, control, and regulate the [development of natural resources], and prevent monopoly and waste and other lax methods that have grown up in the administration of our public-land laws.").

[27] 43 U.S.C. § 1332(3).

[28] 43 U.S.C. § 1332(2)-(3).

[29] 43 U.S.C. § 1802(2)(A).

[30] 43 U.S.C. § 1802(3).

[31] 43 U.S.C. § 1344(a)(1).

[32] *Id.*

[33] *Id.* § 1344(a)(3).

[34] 43 U.S.C. § 1701(a)(9).

[35] U.S. Gov't Accountability Office, No. GAO-07-676R, *supra* note 7 at 3.

[36] 30 U.S.C. § 181, *et seq.*

[37] 30 U.S.C. § 187.

[38] U.S. Bureau of Land Management, No. H-3070-2, Economic Evaluation of Oil and Gas Properties Handbook at I.C, *available at* http://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/blm_handbook.Par.39460.File.dat/h3070-2.pdf.

[39] Outer Continental Shelf Lands Act ("OCSLA") Section 18(a)(4), 43 U.S.C. § 1344(a)(4).

[40] U.S. Bureau of Ocean Energy Management, Regulation and Enforcement Manual, 610.1: Fair Market Value § 1 (Oct. 25, 2010); *see also Cal. ex rel. Brown v. Watt* (*"Watt II"*), 712 F.2d 584, 606 (D.C. Cir. 1983) (upholding Interior's five-year offshore oil and gas leasing plan and finding that it provided for a fair market return in accordance with OCSLA).

[41] *Id.*

[42] U.S. Bureau of Ocean and Energy Management, 2017-2022 Outer Continental Shelf Oil and Gas Leasing Draft Proposed Program (2015) [hereinafter "2017-2022 Draft Proposed Program"] at 8-1, *available at* http://www.boem.gov/2017-2022-DPP/.

[43] *Id.*

[44] *Id.*

[45] *Id.* at 8-3.

[46] *Id.* at 8-3 to 8-12.

[47] 30 U.S.C. § 226(a), (g); *see also Udall v. Tallman*, 380 U.S. 1, 4 (1965) ("Although the Act directed that if a lease was issued on such a tract, it had to be issued to the first qualified applicant, it left the Secretary discretion to refuse to issue any lease at all on a given tract").

[48] See 30 U.S.C. § 226(b)(c).

[49] 30 U.S.C. § 189 (federal lands); see also 25 U.S.C. §§ 396, 396d (tribal lands); 43 U.S.C. § 1334(a) (Outer Continental Shelf).

[50] Regulations governing the Bureau of Land Management's coal, oil, and gas programs may be found in title 43, subtitle B, chapter II, subchapter C, Parts 3000 to 3480 of the Code of Federal Regulations. *See, e.g.,* 43 C.F.R. Part 3100 (Oil and Gas Leasing), Part 3160 (Onshore Oil and Gas Operations), and Part 3400 (Coal Management).

[51] OCSLA Section 18(a)(2), 43 U.S.C. § 1344(a)(2).

[52] OCSLA Section 18(a)(3), 43 U.S.C. § 1344(a)(3).

[53] 30 U.S.C. § 191(a)-(b). One exception is Alaska, which is entitled to 90 percent of the federal royalties for oil, gas, and coal production in the state. *Id.*

[54] 43 U.S.C. § 1337(g)(5). This provision was included in Section 8(g)10 of the OCSLA amendments of 1985 (P.L. 99-272).

[55] Gulf of Mexico Energy Security Act, Pub. Law 109-432 (2006).

[56] *See* Congressional Research Service, No. R40645, U. S. Offshore Oil and Gas Resources: Prospects and Processes 19 (April 26, 2010), *available at* http://fpc.state.gov/documents/organization/142736.pdf.

[57] 43 U.S.C. § 1344(a); 43 U.S.C. § 1701(a)(9).

[58] 30 U.S.C. § 226.

[59] *Id.*

[60] 30 U.S.C. § 226(b)(1).

[61] *Id.*

[62] U.S. Government Accountability Office, No. GAO-14-50, Actions Needed for Interior, *supra* note 4.

[63] 30 U.S.C. § 226(b)(1)(A).

[64] 30 U.S.C. § 226(b)(1)(B); 43 C.F.R. § 3120.5-2; *see also* U.S. Bureau of Land Management, Handbook: H-3120-1 – Competitive Leases at 27 (Feb. 18, 2013), *available at* http://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/blm_handbook.Par.71542.File.tmp/3120%20Handbook.pdf.

[65] 30 U.S.C. § 226(b)(1); *see also* 43 C.F.R. Part 3110. A non-competitive lease offer is a legally binding offer filed along with certain fees paid in advance.

[66] Department of the Interior, Bureau of Land Management, *Advance Notice of Proposed Rulemaking: Oil and Gas Leasing; Royalty on Production, Rental Payments, Minimum Acceptable Bids, Bonding Requirements, and Civil Penalty Assessments*, 80 Fed. Reg. 22148, 22150 (April 21, 2015), *available at* http://www.gpo.gov/fdsys/pkg/FR-2015-04-21/pdf/2015-09033.pdf.

[67] 30 U.S.C. § 201(a)(1) (emphasis added).

[68] U.S. Gov't Accountability Office, No. GAO-14-140, BLM Could Enhance Appraisal Process, More Explicitly Consider Coal Exports, and Provide More Public Information 9 (2013), *available at* http://www.gao.gov/assets/660/659801.pdf.

[69] U.S. Bureau of Land Management, Coal Operations: Competitive Leasing Process, *available at* http://www.blm.gov/wo/st/en/prog/energy/coal_and_non-energy.html (last updated August 22, 2014).

[70] Winning bids are publicly available. *See, e.g.,* U.S. Bureau of Land Management, Powder River Basin Coal Leases by Application, *available at* http://www.blm.gov/wy/st/en/programs/energy/Coal_Resources/PRB_Coal/lba_title.html (last updated March 31, 2015).

[71] 43 U.S.C. § 1344(a)(2)(E).

[72] *Id.* § 1337(a)(1).

[73] *Id.*

[74] U.S. Bureau of Ocean and Energy Management, 2017-2022 Draft Proposed Program, *supra* note 42; U.S. Bureau of Land Management, No. H-3070-2, Economic Evaluation Of Oil And Gas Properties Handbook, *available at* http://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/blm_handbook.Par.39460.File.dat/h3070-2.pdf.

[75] U.S. Bureau of Land Management, No. H-3070-2, Economic Evaluation, *supra* note 74; *see also* BOEM, 2017-2022 Draft Proposed Program, *supra* note 42.

[76] *Id.*

[77] See, e.g., U.S. Bureau of Ocean and Energy Management, Summary of Procedures for Determining Bid Adequacy at Offshore Oil and Gas Lease Sales: Effective July 1999, *available at* http://www.boem.gov/uploadedFiles/BOEM/Oil_and_Gas_Energy_Program/Energy_Economics/Fair_Market_Value/FMV174-3.pdf.

[78] 30 U.S.C. § 226(d).

[79] *Id.*; 43 C.F.R. § 3103.2-2(c).

[80] 30 U.S.C. § 226(d).

[81] *See* 43 C.F.R. §3103.2-2.

[82] 30 U.S.C. § 207; *see also* Federal Coal Leasing Amendments Act of 1975, Pub. L. No. 94-377, 90 Stat. 1083, 1087 (codified as amended at 30 U.S.C. § 181 et seq.).

[83] 43 C.F.R. § 3473.3-1(a).

[84] 43 U.S.C. § 1337(b)(6) ("An oil and gas lease issued pursuant to this section shall … contain such rental and other provisions as the Secretary may prescribe at the time of offering the area for lease …").

[85] U.S. Bureau of Ocean and Energy Management, 2017-2022 Draft Proposed Program, *supra* note 42 at 8-18.

[86] *Id.* at 8-19. For example, in a 2009 Gulf of Mexico lease sale, rental rates were set at $7 to $11 per acre (depending on water depth) for the first five years of the lease, escalating to $14 to $44 per acre in the later years of the lease. *See* U.S. Bureau of Ocean and Energy Management, Proposed Outer Continental Shelf Oil & Gas Leasing Program 2012-2017 at 77 (Nov. 2011), *available at* http://www.boem.gov/uploadedFiles/Proposed_OCS_oil_Gas_Lease_Program_2012-2017.pdf.

[87] U.S. Bureau of Ocean and Energy Management, 2017-2022 Draft Proposed Program, supra note 42 at 8-19.

[88] Office of Natural Resources Revenue, Reported Revenues: Federal Onshore in All States for FY 2012 by Accounting Year (2013), *available at* http://statistics.onrr.gov/.

[89] 30 U.S.C. § 226(b)(1)(A) ("A lease shall be conditioned upon the payment of a royalty at a rate of not less than 12.5 percent in amount or value of the production removed or sold from the lease."). The royalty rate for leases in "special tar sands areas" is fixed at 12.5 percent. *Id.* § 226(b)(2)(A).

[90] 43 C.F.R. § 3103.3-1(a)(1).

[91] 30 U.S.C. § 226(c).

[92] 30 U.S.C. § 207(a); Federal Coal Leasing Amendments Act of 1976, Pub. L. 94-377, 90 Stat. 1083 (Aug. 4, 1976).

[93] 30 U.S.C. § 207(a).

[94] *Id.* § 226(l).

[95] 43 U.S.C. § 1337(a)(1).

[96] *Id*. Courts have also recognized Interior's authority of to set royalty rates and calculate royalties owed to the government. *See Independent Petroleum Ass'n v. DeWitt*, 279 F.3d 1036, 1040 (D.C. Cir. 2002) ("[C]ourts have regularly applied Chevron in royalty cases. In California Co., we deferred to Interior's interpretation of the word "production" for purposes of calculating royalty, noting the Department's duties both to protect the public interest in royalties and to assure 'incentive[s] for development.' 296 F.2d at 388. Similarly, in Mesa Operating Limited Partnership v. Department of Interior, 931 F.2d 318 (5th Cir.1991), the Fifth Circuit applied Chevron in determining whether certain reimbursements were subject to royalty. *Id*. at 322."); *see also Enron Oil & Gas Co. v. Lujan*, 978 F.2d 212, 215 (5th Cir.1992) (applying Chevron to issue of whether state tax reimbursements are subject to royalty); *Marathon Oil Co. v. United States*, 807 F.2d 759, 765–66 (9th Cir.1986) (applying Chevron to Interior's use of a "net-back" method for calculating value for royalty purposes). If Interior raises royalty rates for offshore production, Congress can pass a resolution disapproving this change within 30 days of Interior's action.

[97] 43 U.S.C. § 1337.

[98] *See* U.S. Bureau of Ocean and Energy Management, Proposed Outer Continental Shelf Oil & Gas Leasing Program 2012-2017 at 77 (Nov. 2011), *available at* http://www.boem.gov/uploadedFiles/Proposed_OCS_oil_Gas_Lease_Program_2012-2017.pdf. Alaskan offshore leases utilize a 12.5 percent royalty rate. *Id*.

[99] *Id*.

[100] *See* Congressional Research Service, Outer Continental Shelf: Debate Over Oil and Gas Leasing and Revenue Sharing (2008), *available at* http://www.au.af.mil/au/awc/awcgate/crs/rl33493.pdf.

[101] *See Motor Veh. Mfrs. Ass'n v. State Farm Ins.*, 463 U.S. 29, 43 (1983) (agency decisions are arbitrary if they entirely fail to consider an important aspect of the problem); *California v. Watt* (*"Watt I"*), 688 F.2d 1290, 1317 (D.C. Cir. 1981) (holding that courts can review Interior's leasing decisions for arbitrariness and failure to consider relevant factors).

[102] *See Boesche v. Udall*, 373 U.S. 472, 476 (1963) (noting that Interior has been vested with "general managerial powers over the public lands"); *N.W. Coal. for Alternatives to Pesticides v. Lyng*, 673 F. Supp. 1019, 1024 (D. Or. 1987) ("So long as the BLM's decisions are not irrational or contrary to law, it may manage the public lands as it sees fit") (citing *Natural Resources Defense Counsel v. Hodel*, 819 F.2d 927,980 (9th Cir. 1987)); *see also Amoco v. Watson*, 410 F.3d 722 (D.C. Cir. 2005) (upholding BLM's order to an energy company to pay additional royalties, as "deference is particularly appropriate in the context of a complex and highly technical regulatory program, in which the identification and classification of relevant criteria necessarily require significant expertise and entail the exercise of judgment grounded in policy concerns.")(internal citations omitted).

[103] Michael A. Livermore, *Patience is an Economic Virtue: Real Options, Natural Resources, and Offshore Oil*, 84 U. Colo. L. Rev. 581, 589 (2013).

[104] *See generally*, Avinash K. Dixit & Robert S. Pindyck, INVESTMENT UNDER UNCERTAINTY (1994); James L. Paddock et al., *Option Valuation of Claims on Real Assets: The Case of Offshore Petroleum Leases*, 103 Q. J. Econ. 479 (1988); Jon M. Conrad & Koji Kotani, *When to Drill? Trigger Prices for the Arctic National Wildlife Refuge*, 27 Res. & Energy Econ. 273 (2005); Michael A. Livermore, *Patience Is an Economic Virtue: Real Options, Natural Resources, and Offshore Oil*, 84 U. Colo. L. Rev. 581, 591 (2013); *see also* Anthony C. Fisher, *Investment under Uncertainty and Option Value in Environmental Economics*, 22 Res. & Energy Econ. 197 (2000); W. Michael Hanemann, *Information and the Concept of Option Value*, 16 J. Envtl. Econ. & Mgmt. 23 (1989).

[105] *See* Michael Rothkopf et al., Rutgers Center for Operations Research, *Research Report No. 22-2006, Optimal Management of Oil Lease Inventory: Option Value and New Information* (2006); Ryan Kellog, National Bureau of Economic Research, Working Paper No. 16,541, The Effect of Uncertainty on Investment: Evidence from Texas Oil Drilling (2010); Timothy Dunne and Xiaoyi Mu, *Investment Spikes and Uncertainty in the Petroleum Refining Industry* (Fed. Reserve Bank of Cleveland, Working Paper No. 08-05) (2008); *see also* William Bailey et.al., *Unlocking the Value of Real Options,* Oilfield Review (Winter 2003), at 4 (describing how companies including Chevron Texaco, Anadarko, and El Paso Corporation incorporate real options into their decision-making processes); Soussan Faiz, *Real-Options Application: From Successes in Asset Valuation to Challenges for an Enterprise wide Approach*, J. Petroleum Tech. (Jan. 2001), at 42–47, 74 (analyzing Chevron Texaco's decision not to sell a marginally-performing lease because of its real options value).

[106] U.S. Dept. of Interior, Oil and Gas Lease Utilization – Onshore and Offshore; Report to the President (March 2011) at 4, 6, *available at* http://www.doi.gov/news/pressreleases/loader.cfm?csModule=security/getfile&pageid=239255.

[107] *See* 43 U.SC. § 1337.

[108] *Id.* at 585.

[109] BOEM's hurdle price analysis is designed to ensure that every area included in the Program is expected to "convey rights to at least one field where prompt exploration during the Program is consistent with an optimal allocation of resources." U.S. Bureau of Ocean and Energy Management, 2017-2022 Draft Proposed Program, *supra* note 42.

[110] *See* 30 U.S.C. § 226(b)(1); 43 C.F.R. § 3120.5-2.

[111] *See* U.S. Bureau of Ocean and Energy Management, 2017-2022 Draft Proposed Program, *supra* note 42 at 5-20, 8-3 to 8-19.

[112] U.S. Department of the Interior, Office of the Inspector General, Evaluation: Coal Management Program 8 (June 2013), *available at* http://www.documentcloud.org/documents/712402-inspector-generals-report-on-coal-leases.html ("The FMV determination is critical in coal leasing because a competitive market generally does not exist for coal leases, therefore, the FMV serves as a substitute for competition. For example, we found that over 80 percent of the sales for coal leases in the Powder River Basin received only one bid in the past 20 years. No coal lease has had more than two bidders on a sale.")

[113] *Id.*

[114] U.S. Gov't Accountability Office, No. GAO-14-50, Actions Needed For Interior, *supra* note 4 at 8.

[115] U.S. Bureau of Ocean and Energy Management, 2017-2022 Draft Proposed Program, supra note 42 at 5-20, 8-3 to 8-19.

[116] *Id.*

[117] *Center for Sustainable Economy v. Jewell*, 779 F.3d 588 (D.C. Cir. Mar. 6, 2015). Policy Integrity served as counsel to Petitioner, Center for Sustainable Economy. *See also* Opening and Reply Briefs for Petitioner.

[118] *Id.* at 610 (emphasis added).

[119] *Id.* at 611.

[120] *Id.* at 612 ("Our holding is a narrow one . . . the agency is not permitted to substitute qualitative assessments for well-established quantitative methods whenever it deems such substitutions convenient.").

[121] *Id.*

[122] *See* U.S. Bureau of Ocean and Energy Management, 2017-2022 Draft Proposed Program, *supra* note 42 at 5-20, 8-3 to 8-19.

[123] *Center for Sustainable Economy*, 779 F.3d at 610.

[124] As described above, the Mineral Leasing Act effectively prohibits BLM from setting minimum onshore oil and natural gas bids on a tract-by-tract basis. It states that "[t]he Secretary [must] accept the highest bid . . . which is equal to or greater than the national minimum acceptable bid, without evaluation of the value of the lands proposed for lease." Thus, while the Secretary of the Interior has the authority to raise the national minimum bid, BLM cannot require higher minimum bids for specific leases, absent a legislative revision.

[125] For practical guides to calculating options value, see, for example, Prasad Kodukula & Chandra Papudesu, Project Valuation Using Real Options: A Practitioner's Guide (2006) and Johnathan Mun, Real Options Analysis: Tools And Techniques for Valuing Strategic Investment and Decisions (2d Ed. 2005). *See also* Michael Rothkopf et al., *Optimal Management of Oil Lease Inventory: Option Value and New Information* (Rutgers Center for Operations Research, Research Report 22-2006, 2006); Ryan Kellog, *The Effect of Uncertainty on Investment: Evidence from Texas Oil Drilling* (Nat'l Bureau of Econ. Res., Working Paper No. 16,541, 2010); Timothy Dunne and Xiaoyi Mu, *Investment Spikes and Uncertainty in the Petroleum Refining Industry* (Fed. Reserve Bank of Cleveland, Working Paper No. 08-05, 2008); William Bailey et. al., *Unlocking the Value of Real Options*, Oilfield Review, Winter 2003, at 4 (describing how companies including ChevronTexaco, Anadarko, and El Paso Corporation incorporate real options into their decision-making processes).

[126] *See* Richard L. Revesz, *Quantifying Regulatory Benefits*, 102 Cal. L. Rev. 1423, 1425, 1436 (2014). For example, both the Social Cost of Carbon and Value of a Statistical Life ("VSL") are examples of government agencies serving as catalysts for the quantification of important measures of regulatory costs and benefits.

[127] *See* 43 U.S.C. § 1344(a)(1).

[128] *See* U.S. Government Accountability Office, No. GAO-09-74, Interior Could Do More to Encourage Diligent Development 13 (Oct. 2008), *available at* http://www.gao.gov/new.items/d0974.pdf.

[129] Lise Olson, Fatal truck accidents have spiked during Texas' ongoing fracking and drilling boom, Houston Chronicle (Sept. 11, 2014), *available at* http://www.houstonchronicle.com/news/article/Fracking-and-hydraulic-drilling-have-brought-a-5747432.php?cmpid=email-premium&cmpid=email-premium&t=1a9ca10d49c3f0c8a9#/0.

[130] A price is socially efficient at the point at which the marginal cost to society equals the marginal benefit to society; that is, where net benefits are maximized.

[131] Indeed, private landowners may already price these effects into lease terms; certainly, it would be rational for private landowners who live on or near a potential lease site that they are offering for sale to account for such anticipated impacts as noise pollution, local air pollution, and vehicle traffic when negotiating the sale price.

[132] 30 U.S.C. § 226(d).

[133] *See* 43 C.F.R. § 3103.2-2.

[134] *See* U.S. Bureau of Ocean and Energy Management, Proposed Outer Continental Shelf Oil & Gas Leasing Program 2012-2017 at 77 (Nov. 2011), *available at* http://www.boem.gov/uploadedFiles/Proposed_OCS_oil_Gas_Lease_Program_2012-2017.pdf.

[135] *See* U.S. EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2012 (April 15, 2014), *available at* http://www.epa.gov/climatechange/ Downloads/ghgemissions/US-GHG-Inventory-2014-Main-Text.pdf.

[136] *See, e.g.*, Jayni Foley Hein, Institute for Policy Integrity at NYU School of Law, Capturing Value: Science and Strategies to Curb Methane Emissions from the Oil and Natural Gas Sector (Dec. 2014), *available at* http://policyintegrity.org/files/publications/Capturing_Value_-_Methane_Policy_Brief.pdf.

[137] Mead Gruver, Wyoming's Natural Gas Boom Comes with Smog Attached, Associated Press (Mar. 9, 2011), *available at* http://www.nbcnews.com/id/41971686/ns/us_news-environment/%20%20%22#.VUeFDiFVhBd.

[138] For example, a University of Texas study found that earthquakes occurred more frequently near injection well sites in the Barnett Shale region, with most of the epicenters located within two miles of injection wells. Cliff Frohlich, *Two-year survey comparing earthquake activity and injection-well locations in the Barnett Shale, Tex.*, 109 Proceedings of the Nat'l Acad. of Sciences 13934 (2012). The Ohio Department of Natural Resources attributed a series of earthquakes near Youngstown, Ohio in 2011 to injection into hydraulic fracking wastewater disposal wells. Ohio Dep't of Natural Res., Preliminary Report on the Northstar 1 Class II Injection Well And The Seismic Events In The Youngstown, Ohio, Area (2012), *available at* http://ohiodnr. com/downloads/northstar/UICReport.pdf.

[139] *See, e.g.*, Michael Kiparsky and Jayni Foley Hein, Regulation of Hydraulic Fracturing in California: A Wastewater and Water Quality Perspective, UC Berkeley (April 2013), *available at* https://www.law.berkeley.edu/files/ccelp/Wheeler_HydraulicFracturing_April2013.pdf; Stephen G. Osborn, et al., *Methane contamination of drinking water accompanying gas-well drilling and hydraulic fracturing*, 108 Proceedings of the Nat'l Acad. of Sciences 8172 (2011); M. Dusseault and M. Gray, et al., *Why oil wells leak: cement behavior and long-term consequences*, Society of Petroleum Engineers International Oil and Gas Conference and Exhibition in China, Beijing, China (2000).

[140] For example, in order to prove causation in a case claiming contamination from fracking activities, plaintiffs need to show that contaminants in question were not naturally present in groundwater or environment. *See* Kiparsky and Hein, *supra* note 139 at 33 (citing *William G. Strudley v. Antero Resources Corporation, et al.*, 2012 WL 1932470 (Colo. Dist. Ct. May 9, 2012)). The trial court opinion

in *Strudley* was recently reversed by the Colorado Supreme Court. *See Strudley v. Antero Res. Corp.*, 347 P.3d 149, 151 (Colo. Sup. Ct. 2015) ("We hold that Colorado's Rules of Civil Procedure do not allow a trial court to issue a modified case management order, such as a Lone Pine order, that requires a plaintiff to present prima facie evidence in support of a claim before a plaintiff can exercise its full rights of discovery under the Colorado Rules."). *C.f., Lore v. Lone Pine Corp.*, No. L-33606-85, 1986 WL 637507 (N.J.Super., Law Div., November 18, 1986) (unpublished) (Reported at 1 Tox. Law Rptr. (BNA) 726) (requiring plaintiffs to demonstrate a prima facie case of causation in a case alleging pollution before allowing a case to proceed to discovery).

141 Perhaps the most famous example of this is the Exxon-Valdez oil spill. The catastrophe occurred in 1989, but litigation regarding the damage went on for nearly twenty-five years. When the settlement finally concluded, not only had the aggrieved parties gone nearly a quarter-century without full compensation, but the settlement was reduced about five-fold by the U.S. Supreme Court. *Exxon Shipping Co. v. Baker*, 554 U.S. 471 (2008).

142 BLM regulations establish minimum bond amounts: $10,000 for an individual lease, $25,000 to cover all leases of a single operator in a state, and $150,000 to cover all leases of a single operator nationwide. U.S. Government Accountability Office, No. GAO-10-245, Bonding Requirements and BLM Expenditures to Reclaim Orphaned Wells (Jan. 2010), *available at* http://www.gao.gov/assets/310/300218.pdf.

143 Center for Western Priorities, A Fair Share, *supra* note 10.

144 *Id.* at 7.

145 U.S. Gov't Accountability Office, No. GAO-08-691, The Federal System for Collecting Oil and Gas Revenue, *supra* note 6 at 5-8 (citing a June 2007 Wood McKenzie report finding that the United States ranked 93rd lowest out of 104 oil and gas fiscal systems evaluated).

146 *Id.* at 6. Interior might also consider using a tiered rate that increases and decreases with the global price of oil and natural gas, or as production reaches certain thresholds, as some foreign countries do. *See* Law Library of Congress, Global Legal Research Center, Crude Oil Royalty Rates in Selected Countries (Jan. 2015), *available at* http://www.loc.gov/law/help/crude-oil-royalty-rates/crude-oil-royalty-rates.pdf.

147 *Id.* at 17.

148 *See, e.g.*, Congressional Research Service, Outer Continental Shelf: Debate Over Oil and Gas Leasing and Revenue Sharing (2008), *available at* http://www.au.af.mil/au/awc/awcgate/crs/rl33493.pdf.

149 U.S. Gov't Accountability Office, Coal Leasing: BLM Could Enhance Appraisal Process, *supra* note 68; Tom Sanzillo, The Great Giveaway, *supra* note 7.

150 A December 2012 Reuters report alleged that companies including Peabody Energy and Cloud Peak Energy use trading affiliates to hide profits from overseas sales of Powder River Basin coal, to ensure they only pay royalties to the federal government based on lower U.S. sales prices. Patrick Rucker, Asia coal export boom brings no bonus for U.S. taxpayers, Reuters (Dec. 4, 2012), *available at* http://www.reuters.com/article/2012/12/04/us-usa-coal-royalty-idUSBRE8B30IL20121204.

151 Office of Natural Resources Revenue, Proposed Rule: Consolidated Federal Oil & Gas and Federal & Indian Coal Valuation Reform, 80 Fed. Reg. 608-613 (Jan. 6, 2015).

152 30 U.S.C. § 207(a) (surface coal mines); 43 C.F.R. § 3473.3-2 (underground coal mines); 30 U.S.C. § 226(b)-(c) (onshore oil and gas); 43 U.S.C. § 1337 (offshore oil and gas).

153 *See, e.g.*, Jayni Foley Hein, Institute for Policy Integrity at NYU School of Law, Capturing Value: Science and Strategies to Curb Methane Emissions from the Oil and Natural Gas Sector (Dec. 2014), *available at* http://policyintegrity.org/files/publications/Capturing_Value_-_Methane_Policy_Brief.pdf.

154 30 U.S.C. § 225.

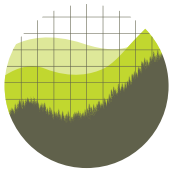
155 While raising royalty rates might have the effect of shifting some development to state and private lands, the most attractive federal parcels, where discovery and development prospects are strongest, would likely continue to be sold competitively at auction. Moreover,

potential production decreases resulting from higher royalty rates, if any, could result in environmental and social benefits, such as reduced habitat and surface disruption, reduced hazardous air pollution, greater mineral resource conservation, and more. *See* Department of the Interior, Bureau of Land Management, Advance Notice of Proposed Rulemaking: Oil and Gas Leasing; Royalty on Production, Rental Payments, Minimum Acceptable Bids, Bonding Requirements, and Civil Penalty Assessments, 80 Fed. Reg. 22148, 22152 (April 21, 2015).

156 *See Theodore Roosevelt Conservation P'ship v. Salazar*, 605 F. Supp. 2d 263, 274 (D.D.C. 2009) *aff'd*, 616 F.3d 497 (D.C. Cir. 2010); *Hammond v. Norton*, 370 F.Supp.2d 226, 245–46 (D.D.C. 2005); *see also Pub. Utils. Comm'n of Cal. v. FERC*, 900 F.2d 269, 282–83 (D.C. Cir. 1990) (finding that NEPA does not require agencies to consider environmental effects of actions that are not reasonably foreseeable, especially in light of the agency's discussion of how it would mitigate any effects that may occur in the future); *cf. NRDC v. Hodel*, 865 F.2d 288, 298–99 (D.C. Cir.1988) (finding a "few sentences" in the Final Environmental Impact Statement insufficient to address the effects of "reasonably foreseeable" actions).

157 *See* 30 C.F.R. § 1206.109-1206.111.

158 *See* 43 U.S.C. § 1701(a)(8).



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