

# Economic Effects of Pausing Oil and Gas Leasing on Federal Lands



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**Our Mission is ... To apply economics to the sustainable management of our natural resources, the development of healthy communities, and the conservation of nature.**

# Executive Summary

**A**fter President Biden issued a temporary pause in federal oil and gas leasing in January, industry representatives and their trade groups declared that the sky was falling and that their workers and the economy were doomed. That dire claim—repeated in scores of news articles—is false. In this report, we present economic research on a federal oil and gas leasing pause from section (208) of the Executive Order on Tackling the Climate Crisis at Home and Abroad, focusing on the onshore portion of the federal oil and gas program. We examine changes in industry output and employment that may occur from a federal leasing pause, looking at national and regional economic impacts.

For regional economic impacts, we focus on five Intermountain West states that dominate federal production of onshore oil and gas (Colorado, Montana, New Mexico, Utah, and Wyoming). We detail the stockpiled leases and permits in these states and estimate years of future drilling opportunities based on current stockpiled non-producing acres that are available for development. We also provide an overview of national benefits and costs of the leasing pause along with a longer-term economic perspective on how rural Western communities and the U.S. Department of Interior (DOI) can facilitate an economic and energy transition that supports broader economic diversification, with a focus on benefitting workers and communities dependent on oil and gas activity.

Upon a thorough economic investigation of a pause in federal oil and gas leasing, **we have found national economic impacts to be negligible**, as federal domestic production of oil and gas, and associated employment, will not be materially affected by a federal leasing pause in the short-term (i.e., lasting up to one year). **Nationally**, we find that:

- Federal onshore oil and gas production constitutes a minor component of total domestic production—6% and 8%, respectively. Notably, a

federal leasing pause does not curtail drilling or production on federal lands, nor does it have any effect on Tribal, state, or private leasing.

- There is no correlation between federally leased acres and oil and gas employment.
- Onshore federal oil and gas leases issued have been steadily declining for the last 20 years, under different Administrations, indicating declining economic demand for federal leases and that remaining unleased public lands are less desirable for oil and gas development.
- There are greater than 14 million acres of non-producing leases on federal lands, or more than 50% of all onshore leased federal land. Assuming productivity similar to producing federal leases and accounting for lease expirations, non-producing leases can theoretically support 75 years of future drilling opportunities on all U.S. federal lands.
- If a federal leasing pause is extended and federal production eventually becomes constrained, we anticipate that a portion of regional oil and gas investments will be shifted to private and state lands.

**For regional economic effects in the Intermountain West, we have found impacts to be minimal in the short-term**, as the most resource reliant states have ample stockpiles of leases and permits to easily continue the status quo in terms of new drilling on federal lands. **Regionally**, we find that:

- Only 15 out of 205 Intermountain West counties had greater than 100 federal oil and gas lease sales from 2016-2020. More than half these counties (9) were in Wyoming.
- The bulk of federal onshore oil and gas production happens in five Intermountain West states: Colorado, Montana, New Mexico, Utah, and Wyoming; 86% of federal onshore oil and 95% of federal onshore natural gas was produced in these five states during 2019.
- Oil and gas producers located in Wyoming are the most dependent on federal oil and gas resources; during 2019 nearly 50% of all oil and more than 80% of all gas produced in Wyoming was extracted from federal lands.
- However, Wyoming has ample stockpiled non-producing acres and permits and an estimated 67 years of drilling opportunities on federal lands, at historical levels of regional oil and gas development, facilitated by this stockpile.
- Oil and gas producers located in New Mexico are also substantially dependent on federal oil and gas resources; between 50 and 55% of both oil and gas produced during 2019 was from federal lands, although the federal lands share of leasing is decreasing.
- New Mexico has fewer non-producing acres than all other Intermountain West states, but has stockpiled numerous recent leases, permits, and lease acreage, resulting in at least 11 years of drilling opportunities on federal lands at historical levels of regional oil and gas development.

In terms of national economic efficiency analysis and cost-benefit analysis, we found that the benefits of a federal leasing pause outweigh the costs by at least a ratio of 40:1. Our **economic efficiency analysis** finds that:



Photo: Wild Earth Guardians

- Benefits of a federal leasing pause include conservation opportunities, data collection opportunities, a window for reforming federal oil and gas policies, and catalyzing a national course correction on energy production.
- A federal leasing pause of up to one year, would save approximately 1.4 million acres of public lands from being leased and developed for oil and gas extraction (likely even after leasing resumes), resulting in substantial public conservation values that could be collected by the federal government. The resulting improvement in societal welfare, or public willingness-to-pay for conservation, if 1.4 million acres of public lands remained un-leased for oil and gas in the future, is estimated to be at least \$3 billion using benefit transfer methods.
- The costs of a federal leasing pause are represented, almost exclusively, by presumed lost lease sale revenue.

- If we assume a similar amount of total receipts from competitive federal oil and gas sales as generated in FY 2020, a total of \$78 million may be lost in the first year of a federal leasing pause. This represents a tiny fraction of the benefits that could accrue if federal lands that would have otherwise been leased for oil and gas, without the leasing pause, were instead protected from extractive development (\$3 billion).

Taking a long-term perspective, **we find evidence of previous rural economic restructuring and multiple future transition opportunities** for rural regions with large portions of federal lands. Specifically, we find that:

- Most rural areas in the Intermountain West have already undergone economic restructuring from extractive industries and primary manufacturing to service-oriented economies over the last 40 years, with no leasing pause in place.
- In the rural West, oil and gas dependent counties were negatively associated with migration rates from 1980-2010 while counties with public lands with greater protection were positively associated with greater migration rates. Conservation attracts people and businesses; intensive oil and gas development repels people and businesses over the long run.
- Less than 2.5% of all employment in the five Intermountain West states comes from mining (as defined by the Bureau of Labor Statistics), which includes oil and gas sectors. On the other hand, over 50% of all employment in these states comes from service industries.
- The COVID-19 pandemic has intensified the shift from primary extraction and manufacturing to service industries and amenity development in the rural West.

- Energy sector-specific transition jobs would help dampen any future job displacement from future limitations on oil and gas development. Jobs that focus on cleaning legacy and existing wells, by incorporating comparable skills as those found in oil and gas work, will represent win-win scenarios.
- A stimulus program to plug the approximately 2.3 million unplugged abandoned oil and gas wells in the U.S. could produce between 55,000 and 85,000 direct annual jobs for ten years in duration and would result in the elimination of 251,749 metric tons of annual methane emissions.
- Reducing methane waste from existing oil and gas production facilities, through Leak Detection and Repair (LDAR) and limiting venting and flaring, offers additional opportunities for creating jobs, reducing emissions, and limiting waste of public resources.
- Finally, responsibly siting renewable energy projects on and near federal lands can offer clean energy production and good-paying jobs in affected regions, as most oil and gas dependent regions are good candidates for wind and solar energy production.

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# 1 Introduction

Over the last century, fossil fuels have played a critical role in modernizing and industrializing America. The Bureau of Land Management (BLM) has leased tens of millions of acres of public land and issued tens of thousands of drilling permits to the oil and gas industry.<sup>1</sup> Unfortunately, the large scale of leased land and the fast pace at which drilling permits were approved has come at the expense of other agency programs and our environment. In addition, the U.S. energy composition is changing with renewable energy becoming more affordable and widely used. Scientists estimate that fossil fuels produced on federal lands account for 23.7 and 13.1 percent of national emissions for carbon-dioxide and methane, respectively.<sup>2</sup>

Elected officials in Congress have also encouraged oil and gas production on public lands by granting tax subsidies and exemptions from environmental laws. However, development of fossil fuels is polluting our air and water, fragmenting bird and wildlife habitat, damaging public health, and causing our climate to change. With other energy options now available, the past ways of providing preferential treatment for oil and gas development by Congress and the BLM must be phased out due to the overwhelming public costs of climate change and other pollution.

As part of an aggressive package of new climate policies, President Biden issued a pause on new federal oil and gas leasing<sup>3</sup> to allow time for a comprehensive review of leasing and permitting policies. Given DOI's jurisdiction over federal oil and gas leasing and permitting terms,<sup>4</sup> public lands provide an opportunity for the federal government to implement a strategy for addressing

the market failures that brought us climate change. By initiating a review of the federal leasing program, the Administration can critically examine the economic, environmental, and health implications of the federal oil and gas leasing program and plan for a transition to cleaner energy production that is equitable, good for local economies, and good for the environment.



Photo: BLM

1 Bureau of Land Management Oil and Gas Statistics, <https://www.blm.gov/programs-energy-and-minerals-oil-and-gas-oil-and-gas-statistics>

2 The Environmental Defense Fund estimated a baseline emissions inventory for 2019 based on a combination of EPA Greenhouse Gas Reporting Program data and previously published measurement studies, as reported in Alvarez et al. 2018 (Alvarez et al., Assessment of Methane Emissions from the U.S. Oil and Gas Supply Chain, 361 SCIENCE, 186–188 (2018)). A USGS spatial dataset was used to determine which well sites are located on federal land.

3 Executive Order on Tackling the Climate Crisis at Home and Abroad, <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/>. A preliminary injunction issued on June 15, 2021 by a federal judge has enjoined DOI from implementing the leasing pause.

4 Leshy, John D. 2019. "Interior's Authority to Curb Fossil Fuel Leasing." Environmental Law Reporter News & Analysis, 49: 10631.

## 2 National Distributional Effects of a Federal Leasing Pause

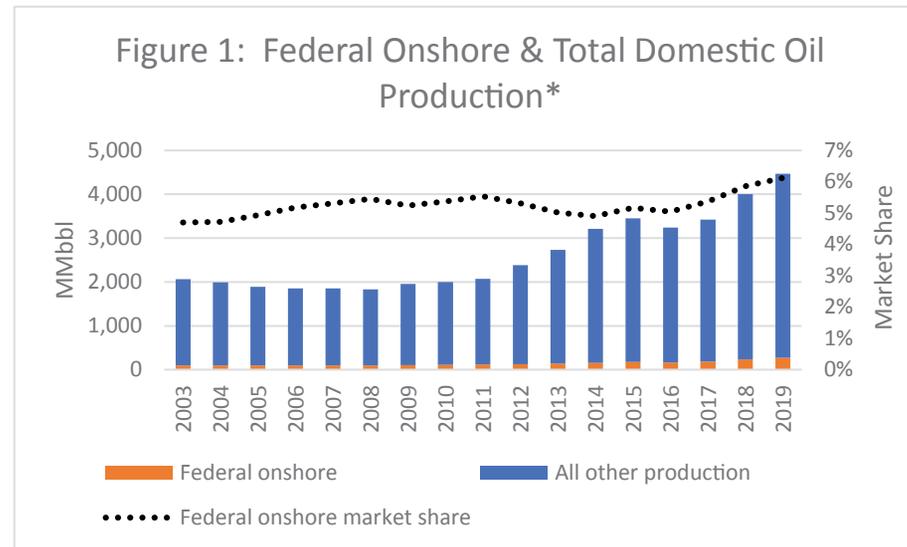
We start our economic investigation of a federal leasing pause by examining macro distributional effects for the nation regarding oil and gas production and employment. The primary component of distributional effects, as typically investigated in accordance with National Environmental Policy Act (NEPA) environmental impact analyses, is economic impact analysis. Economic impact analysis measures the resulting market impacts, such as changes to oil and gas industry output and employment, associated with a change in final demand resulting from a new land management policy. Economic impacts are part of distributional effects because they represent shifts in regional wealth that ultimately balance out nationally, where the additional investments and jobs in one region come at the expense of another region.

### 2.1 National Economic Impacts from a Federal Leasing Pause

Federal onshore oil and gas production currently constitutes a minor

component of total domestic production—6% and 8%, respectively (see Figures 1 and 2). Most federal onshore oil and gas production occurs in five Intermountain West states: Colorado, Montana, New Mexico, Utah, and Wyoming. With such a limited role in overall domestic production, a federal leasing pause is not expected to have a material impact on the industry or onshore production levels of oil and gas.<sup>5</sup>

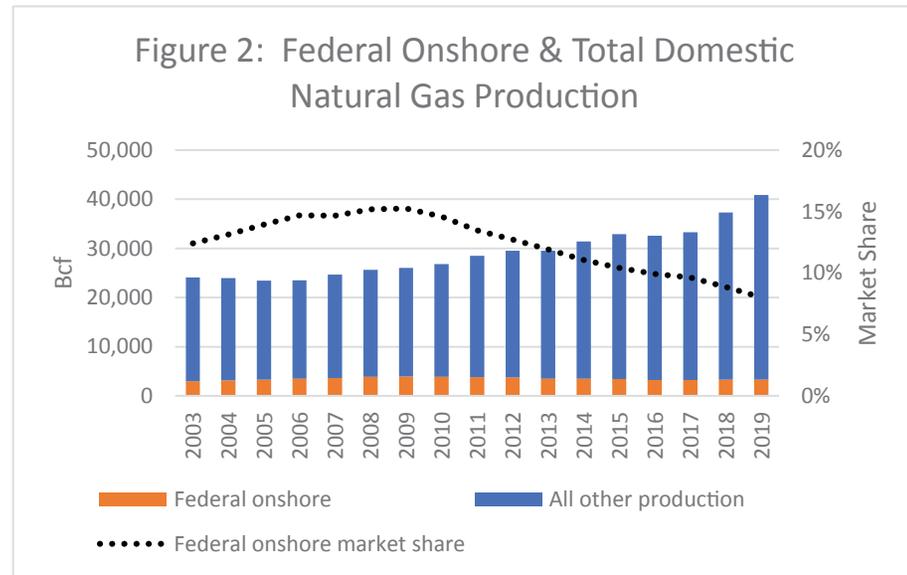
Given the minor role of federal onshore oil and gas among total domestic oil and gas production, we expect minimal short-term impacts to overall U.S. production of oil and gas and associated employment. If a federal leasing pause were to become permanent, or if Congress were to end federal oil and gas leasing, we could expect that decreases in total production that might eventually occur to be partially offset, or absorbed, by increased production on state and private lands.<sup>6</sup> That is, oil and gas investments that would have gone towards leasing on federal lands will be shifted to greater investments on non-federal lands. Additionally, existing federal leases would not be affected



MMbbl = million barrels. \*All other production (blue bars) includes all private oil production onshore and offshore and federal offshore oil. Data Source: U.S. Department of Energy, Energy Information Administration ([https://www.eia.gov/dnav/pet/pet\\_crd\\_crpdn\\_adc\\_mbbbl\\_a.htm](https://www.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbbbl_a.htm)); U.S. Department of the Interior, Office of Natural Resources Revenue (<https://revenue.data.doi.gov/query-data/>); CEI calculations.

- Indeed, monthly U.S. field production of crude oil, as reported by the Energy Information Administration, show that March 2021 production was slightly greater than January 2021 production and that overall monthly production has been steady since the announcement of the leasing pause, with a slight dip in production in February 2021.
- A shift in oil and gas investments from federal lands to non-federal lands can ease adverse regional economic effects but can also create emission “leakages” to other regions, where reduced future federal oil and gas production and associated emissions are partially leaked to private lands and foreign countries. Prest (2021) estimates that approximately 20% of future lost federal production and emissions resulting from a moratorium on federal oil and gas leasing (onshore and offshore) would be offset by increases in production on non-federal lands. Prest, B. *Supply-Side Reforms to Oil and Gas Production on Federal Lands: Modeling the Implications for Climate Emissions, Revenues, and Production Shifts*, Resources for the Future, Working paper 20-16 (updated March 2021).

by a long-term pause in federal leasing, which will lead to some oil and gas investments shifting to federal lands already in production.



Bcf = billion cubic feet. \*All other production (blue bars) includes all private gas production onshore and offshore and federal offshore gas. Data Source: U.S. Department of Energy, Energy Information Administration ([https://www.eia.gov/dnav/ng/ng\\_prod\\_sum\\_a\\_EPG0\\_FGW\\_mmcfa.htm](https://www.eia.gov/dnav/ng/ng_prod_sum_a_EPG0_FGW_mmcfa.htm)); U.S. Department of the Interior, Office of Natural Resources Revenue (<https://revenue.data.doi.gov/query-data/>); CEI calculations.

Further evidence supporting a lack of short-term economic impacts resulting from a federal leasing pause comes from correlation analysis of oil and gas industry employment levels and federal leasing. We examined correlations between jobs and federally leased acres, well spuds, oil and gas production levels, the price of oil (West Texas Intermediate), and the price of gas (Henry Hub).<sup>7</sup> The price of oil is strongly correlated with job levels; all other variables were found to have, at most, moderate correlation with industry employment (Table 1). The amount of federally leased acres shows no correlation with oil

and gas employment, indicating that a brief pause in federal leasing will have zero effect on employment levels.

**Table 1: Oil & Gas Employment Correlation Coefficients**

Variable	Correlation Coefficient	P-Value Significance
Federal Leased acres	0.222	
Federal Producing leased acres	0.551	**
Federal Well spuds	0.106	
U.S. oil production (total)	0.438	*
U.S. gas production (total)	0.554	**
Price of oil	0.789	****
Price of gas	0.311	

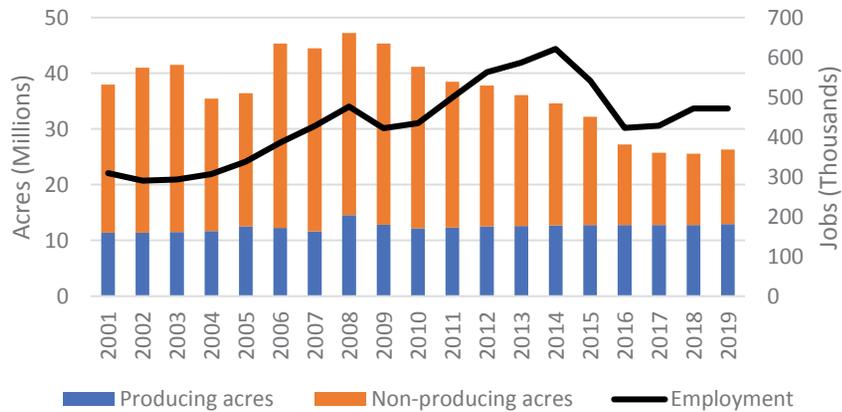
Significance levels are: 0.10\*, 0.05\*\*, 0.01\*\*\*, and 0.001\*\*\*\*.

Figure 3 depicts federal onshore leased acres (producing and non-producing) and industry employment levels. The quantity of non-producing acres<sup>8</sup> (which logically cannot be driving employment levels) has fluctuated over the last 20 years, while producing acres have held relatively constant and are only mildly correlated with fluctuating employment levels. Due to the minor role of onshore federal oil and gas production in total domestic production, federal leases have little effect on overall oil and gas employment. The real driver of oil and gas employment is the price of oil (see Figure 4).

<sup>7</sup> We use QCEW data from the three main sectors related to the primary extraction and production of oil and gas for the following NAICS codes: 211 (Oil and gas extraction), 213111 (Drilling oil and gas wells), and 213112 (Support activities for oil and gas operations).

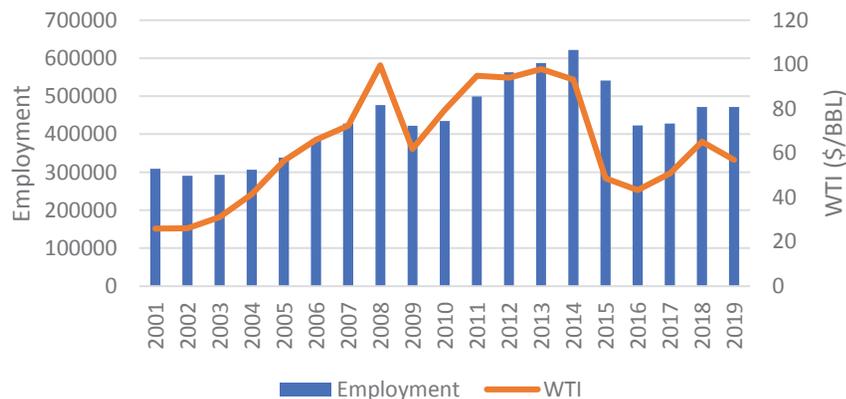
<sup>8</sup> Lease data published by the BLM details the number of federal oil and gas leases and associated acreage, as well as the number of producing leases and acreage. The difference between the two is non-producing leases and acreage.

Figure 3: Onshore Federal Leased Acres and Oil & Gas Employment



Employment numbers are QCEW data for the three main sectors related to the primary extraction and production of oil & gas: NAICS codes 211 (Oil and gas extraction), 213111 (Drilling oil and gas wells), and 213112 (Support activities for oil and gas operations). Data Source: U.S. Department of the Interior, Bureau of Land Management (<https://www.blm.gov/>)

Figure 4: U.S. Oil & Gas Employment and Price of Oil



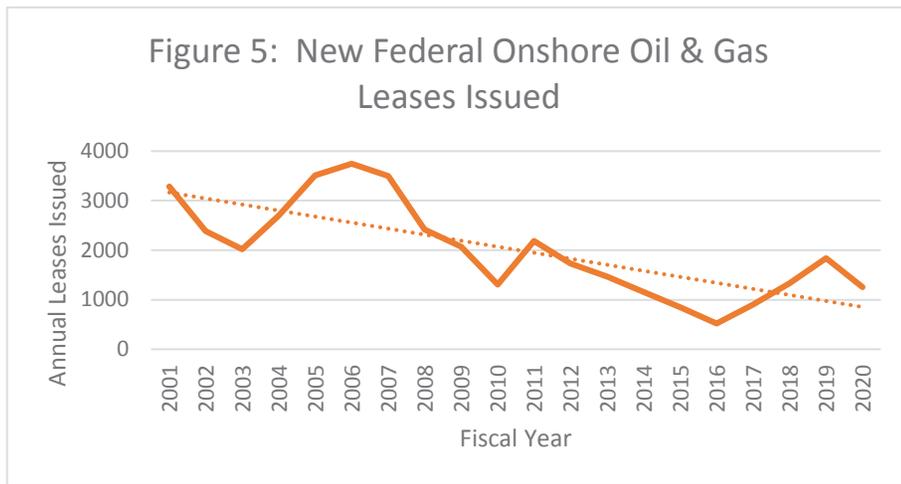
BBL = barrel. Employment numbers are QCEW data for the three main sectors related to the primary extraction and production of oil & gas: NAICS codes 211 (Oil and gas extraction), 213111 (Drilling oil and gas wells), and 213112 (Support activities for oil and gas operations). Data Source: U.S. Department of Energy, Energy Information Administration (<https://www.eia.gov/dnav/pet/hist/rwtcA.htm>); U.S. Department of Labor, Bureau of Labor Statistics (<https://data.bls.gov/PDQWeb/en>).



Photo: Wild Earth Guardians

## 2.2 Declining Economic Demand for Federal Oil and Gas Leases

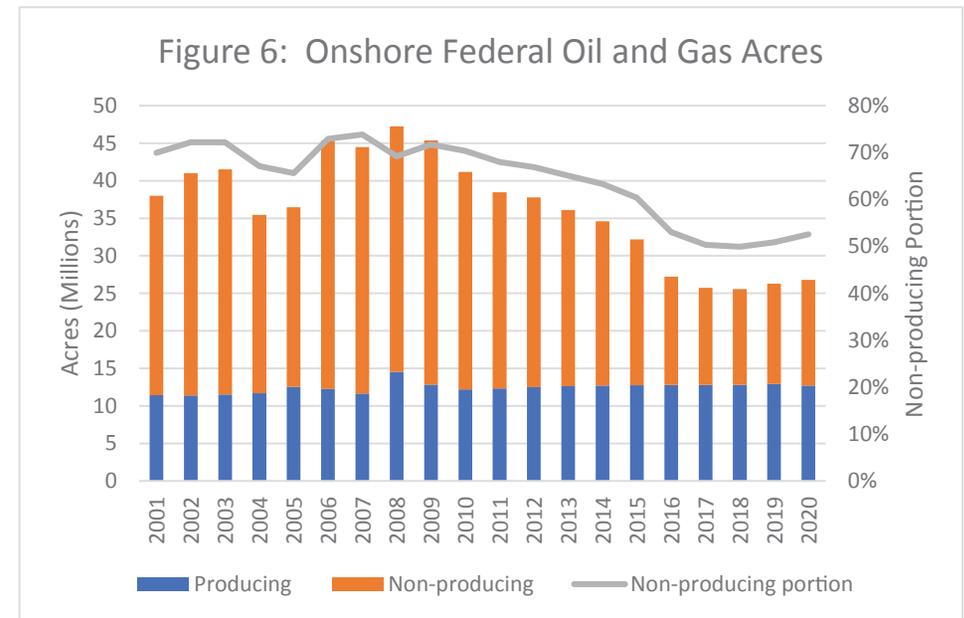
Figure 5 shows trends in new federal onshore leases issued during the last 20 years. The trendline indicates a steady decline in demand for new leases, despite bumps under two Republican Administrations and one Democrat Administration. The Shale Boom of the early 2010s is starting to wane for potential federal lands, and the remaining federal lands with technically recoverable resources are becoming less and less economic. This is the standard process with extracting natural resources—each subsequent entry becomes less profitable, though technological advances like fracking can partially reset the market. The surplus leasing that occurred under the Trump Administration (FY 2017—FY 2019) is indicative of stockpiling by the industry and will offset any short-term economic harm from a federal leasing pause.



Data Source: U.S. Department of the Interior, Bureau of Land Management (<https://www.blm.gov/programs-energy-and-minerals-oil-and-gas-oil-and-gas-statistics>)

Nationally, the stock of producing acres has held relatively constant over the last 20 years (Figure 6). The decline in demand for leases has thus been

concurrent with a decline in non-producing acres. Despite this decline there are still more federal lands leased than drilled and producing; the industry had stockpiled approximately 14,000 leases encompassing more than 14 million acres—more than 50% of all onshore leased federal land.<sup>9</sup> These stockpiled non-producing areas have yet to be developed and provide many years of future drilling opportunities.



Data Source: U.S. Department of the Interior, Bureau of Land Management (<https://www.blm.gov/programs-energy-and-minerals-oil-and-gas-oil-and-gas-statistics>); CEI calculations.

<sup>9</sup> A large number of federal leases were stockpiled by the oil and gas companies near the end of the Trump presidency, and the BLM is still working to process and issue these leases. As the BLM works through the backlogged lease sales, leases have been issued during the ensuing months, despite a federal leasing pause. The non-producing leases and acres values used in our analyses reflect the sum of FY2020 non-producing leases and acres (as published by the BLM) plus all additional leases/acres issued between 10/1/2020 and 5/14/2021.

### 3 Regional Economic Impacts of a Federal Leasing Pause

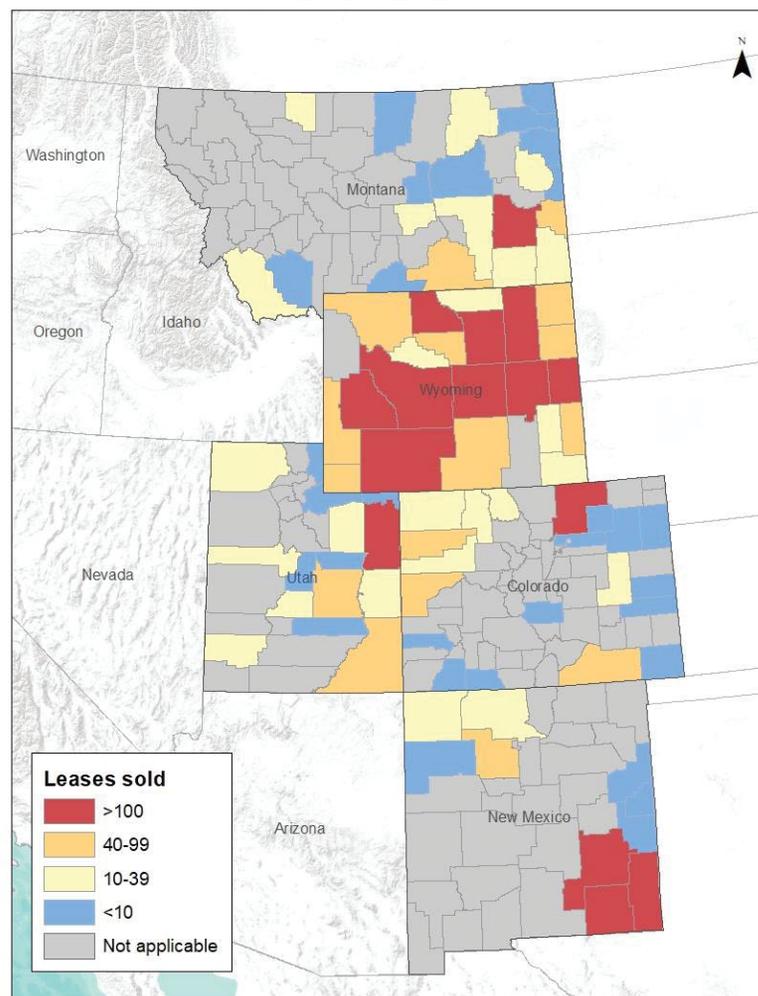
While the national economic impacts of a leasing pause appear minimal, the bulk of federal onshore oil and gas production happens in five Intermountain West states: Colorado, Montana, New Mexico, Utah, and Wyoming. In 2019, 86% of federal onshore oil and 95% of federal onshore natural gas was produced in these five Intermountain West states.<sup>10</sup> Thus, our regional economic impact analysis of a federal leasing pause focuses on these five states and their counties. While modest effects of a federal leasing pause may be felt in places like the Dakotas, Alaska, Texas, California, and parts of the South, the Intermountain West states have the greatest overlap in public lands and large oil and gas fields.

Over the last two decades, far more federal oil and gas leases have been sold in Wyoming than in any other Intermountain West state. Figure 7 portrays the spatial distribution of federal onshore oil and gas lease sales in the Intermountain West between 2016-2020, when more than 2,500 leases were sold in Wyoming (more than in the other four Intermountain West states combined).

#### 3.1 Relative Importance of Oil and Gas in Intermountain West States

The relative importance of oil production in the Intermountain West has grown in recent years (Figure 8). In 2003, for example, total Intermountain West oil production (*from federal and private land*) accounted for less than 10% of all U.S. production (*onshore and offshore*), but by 2020 grew to 17% of total U.S. production in large part due to escalating Permian Basin production in New Mexico. During this same time, the relative importance

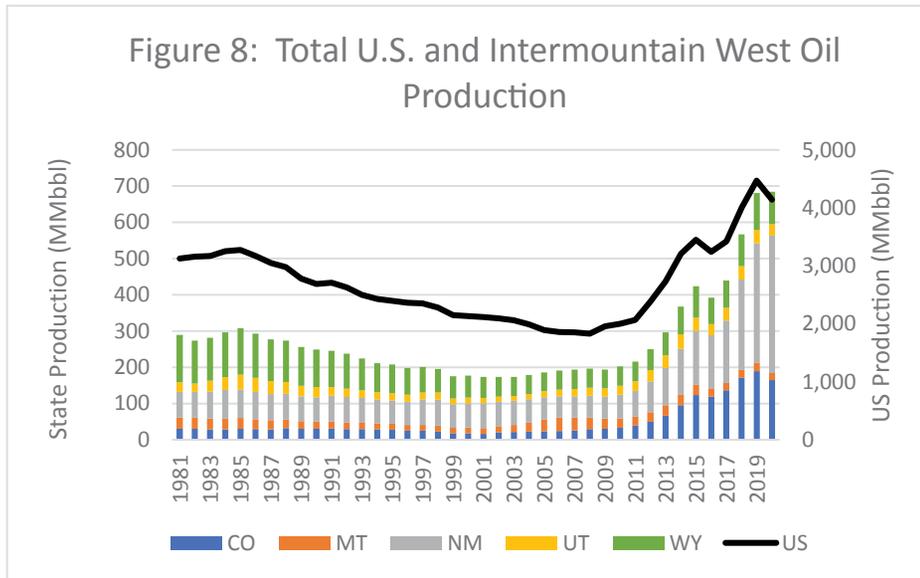
Figure 7: Federal Oil and Gas Leases Sold by County 2016-2020



All lease data for MT, WY, and NM is from available Eplanning and maps data at <https://www.blm.gov/programs/energy-and-minerals/oil-and-gas/leasing/regional-lease-sales> (respective state/years). Data for CO is from <https://www.blm.gov/site-page/services-geospatial-gis-data-colorado>. Data for UT is from <https://www.blm.gov/services/geospatial/GISData/utah>.

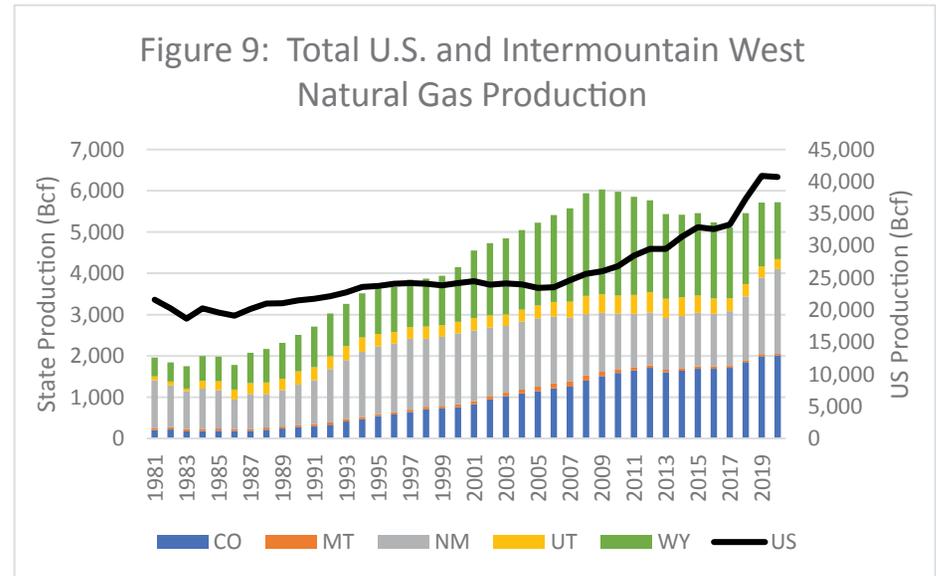
<sup>10</sup> U.S. Department of the Interior, Office of Natural Resources Revenue (<https://revenue.data.doi.gov/query-data/>).

of total Intermountain West natural gas production (*federal and private*) declined from 20% to 14% of total U.S. production (*onshore and offshore*) (Figure 9). Thus, the Intermountain West region is responsible for producing approximately 15% of all U.S. oil and natural gas. In 2020 New Mexico and Colorado were the two largest oil and natural gas producers in the region, and Wyoming was third largest. Montana and Utah are relatively small producers in comparison to the other three Intermountain West states.



MMbbl = million barrels. Data Source: U.S. Department of Energy, Energy Information Administration ([https://www.eia.gov/dnav/pet/pet\\_crd\\_crpdn\\_adc\\_mbbbl\\_a.htm](https://www.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbbbl_a.htm)).

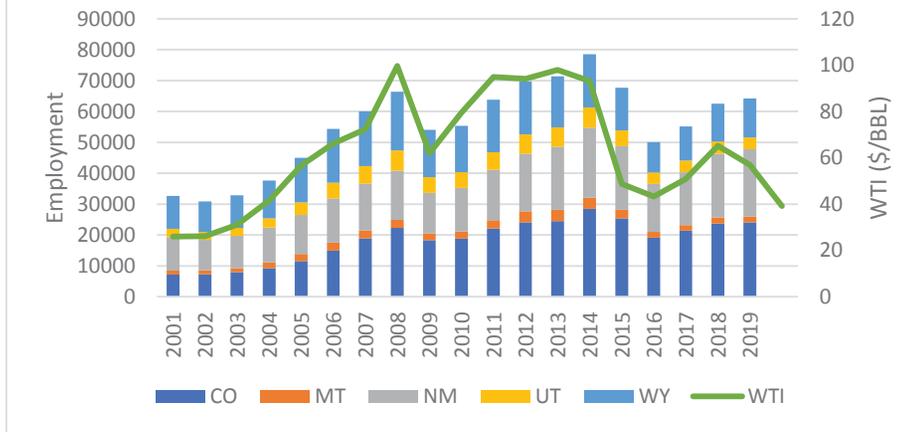
Similar to the national correlations between the price of oil and employment, we find that oil and gas employment in Intermountain West states tracks closely with oil price trends and is not correlated with new federal leases in the region. Figure 10 illustrates the relationship between Intermountain West state's oil and gas employment with the price of oil.



Bcf = billion cubic feet. Data Source: U.S. Department of Energy, Energy Information Administration ([https://www.eia.gov/dnav/ng/ng\\_prod\\_sum\\_a\\_EPGO\\_FGW\\_mmcf\\_a.htm](https://www.eia.gov/dnav/ng/ng_prod_sum_a_EPGO_FGW_mmcf_a.htm)).

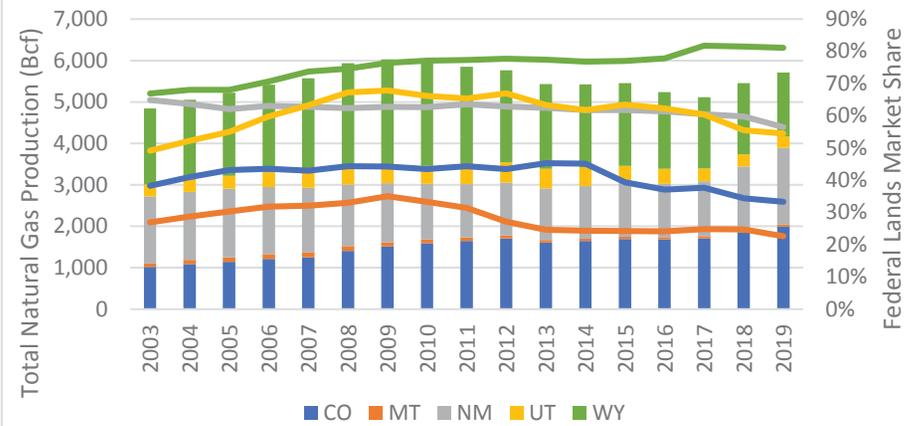
There is considerable variation in the relative importance of oil and gas extraction from federal lands to the Intermountain West states' economies, as shown in Figures 11 and 12, which depict each state's total oil and gas production and the portion derived from federal lands. Oil and gas extracted from federal lands constitute a particularly notable portion of total extraction for both New Mexico and Wyoming. During 2019 nearly 50% of all oil and more than 80% of all gas produced in Wyoming was extracted from federal land. In New Mexico between 50 and 55% of both oil and gas produced during 2019 was produced from federal land, although this has been declining over the past decade. In contrast, although Colorado's oil and gas production levels have increased notably since 2003, the portion derived from federal land has declined, indicating an increased reliance on production from privately owned land.

Figure 10: States' Oil & Gas Employment and Price of Oil



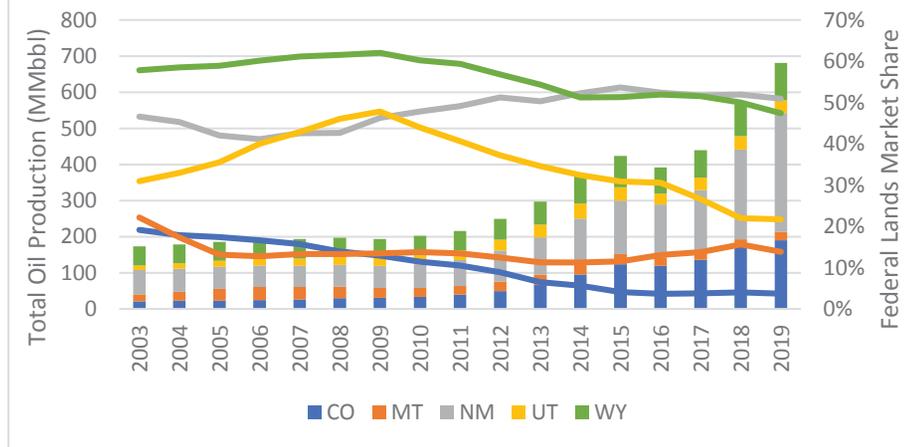
BBL = barrel. Data Source: U.S. Department of Energy, Energy Information Administration (<https://www.eia.gov/dnav/pet/hist/rwtcA.htm>); U.S. Department of Labor, Bureau of Labor Statistics (<https://data.bls.gov/PDQWeb/en>). Employment numbers are QCEW data for the three main sectors related to the primary extraction and production of oil & gas: NAICS codes 211 (Oil and gas extraction), 213111 (Drilling oil and gas wells), and 213112 (Support activities for oil and gas operations).

Figure 12: Federal Share of Natural Gas Production for Intermountain West States



Bcf = billion cubic feet. Data Source: U.S. Department of Energy, Energy Information Administration ([https://www.eia.gov/dnav/ng/ng\\_prod\\_sum\\_a\\_EPG0\\_FGW\\_mmcf\\_a.htm](https://www.eia.gov/dnav/ng/ng_prod_sum_a_EPG0_FGW_mmcf_a.htm)); U.S. Department of the Interior, Office of Natural Resources Revenue (<https://revenuedata.doi.gov/query-data/>); CEI calculations.

Figure 11: Federal Share of Oil Production for Intermountain West States



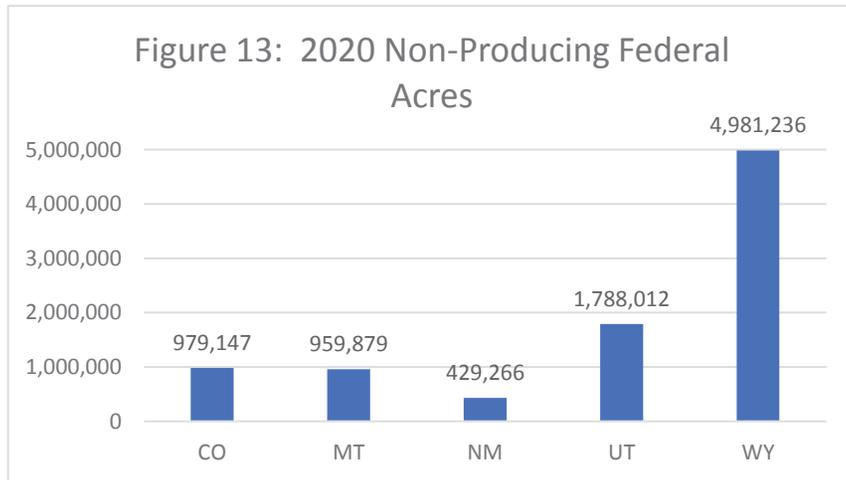
MMbbl = million barrels. Data Source: U.S. Department of Energy, Energy Information Administration ([https://www.eia.gov/dnav/pet/pet\\_crd\\_crpdn\\_adc\\_mbbbl\\_a.htm](https://www.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbbbl_a.htm)); U.S. Department of the Interior, Office of Natural Resources Revenue (<https://revenuedata.doi.gov/query-data/>); CEI calculations.

### 3.2 Stockpiled Non-producing Leases on Federal Intermountain West Lands

In 2020, nearly two-thirds of the approximately 14 million non-producing federal onshore acres stockpiled by the industry were in the five Intermountain West states. Far more acres have been stockpiled by the industry in Wyoming than any other Intermountain West state, and far fewer in New Mexico (Figure 13). This, in conjunction with New Mexico's dependency on federal lands for oil and gas production, indicates that a long-term federal leasing pause or a significant decrease in federal leasing may have a more substantial impact on New Mexico's economy than on other states. However, southeastern New Mexico counties of Lea, Eddy, and Chaves have ample private oil and gas development opportunities<sup>11</sup> due to the productivity of the Permian

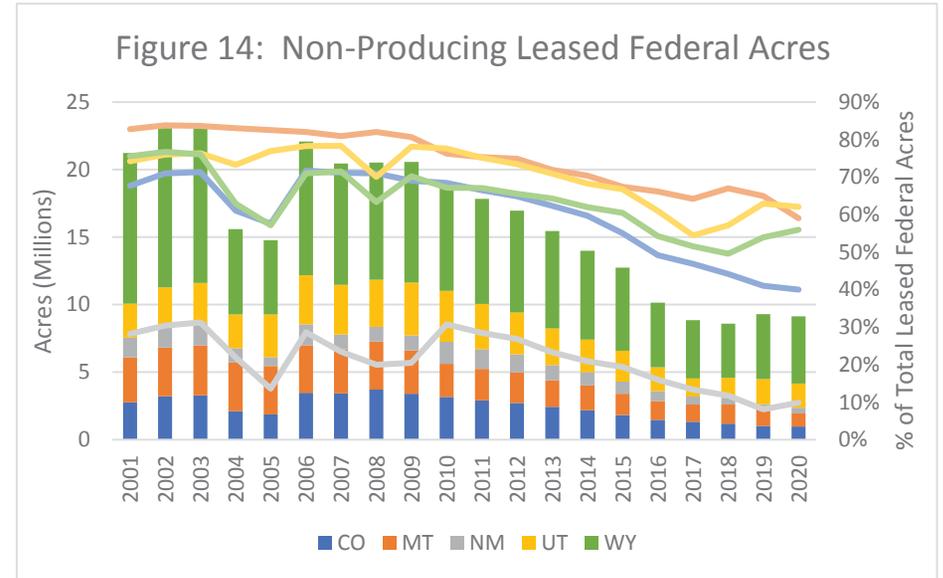
<sup>11</sup> U.S. Energy Information Administration, State Profile and Energy Estimates, <https://www.eia.gov/state/?sid=NM>.

Basin and adjacency to abundant private production in Texas that can largely offset adverse effects that may stem from a phasing down of federal leasing in the region.



Data Source: U.S. Department of the Interior, Bureau of Land Management (<https://www.blm.gov/programs-energy-and-minerals-oil-and-gas-oil-and-gas-statistics>); CEI calculations.

Mirroring the national trend, non-producing federal acreage and its relative importance is declining in each state (Figure 14). These trends are indicative of the industry’s turn toward private land and decreasing economic demand for federal leases. However, despite the decline in non-producing acres, in nearly all Intermountain West states roughly 40% to 60% of leased acres are currently non-producing and thus available for future oil and gas development and production. In New Mexico, however, nearly all leased public lands are already developed and producing. While future oil and gas development will continue to occur on existing leases, only 10% of leased federal land in New Mexico is fully available for future oil and gas development.

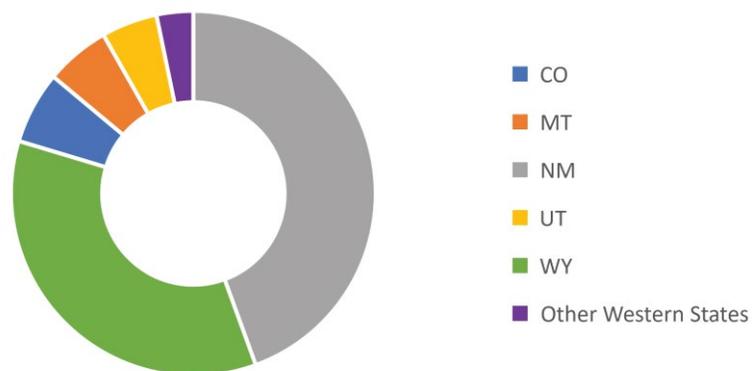


Data Source: U.S. Department of the Interior, Bureau of Land Management (<https://www.blm.gov/programs-energy-and-minerals-oil-and-gas-oil-and-gas-statistics>); CEI calculations.

In addition to amassing a stockpile of federal leases across the Intermountain West, oil and gas companies have amassed a stockpile of approved applications for permits to drill (APDs) on federal lands. Almost 9,000 approved and unused federal APDs are available for use in the West, distributed as depicted in Figure 15.<sup>12</sup> Nearly 80% of the stockpiled APDs are for drilling in New Mexico and Wyoming. With undeveloped leased acreage and drilling permits in hand, the oil and gas industry can continue drilling new wells, producing oil and gas, and providing employment from federal lands, in addition to leasing and producing on Tribal, state, and private lands.

<sup>12</sup> Source: BLM’s May 31, 2021 APD Status Report.

Figure 15: Distribution of BLM APDs Approved & Available to Drill



Data Source: U.S. Department of the Interior, Bureau of Land Management (<https://www.blm.gov/programs/energy-and-minerals/oil-and-gas/operations-and-production/permitting/applications-permits-drill>); CEI calculations.

### 3.3 Future Federal Onshore Drilling Opportunities

Future years of drilling opportunities, without new federal leases, is an important metric to illustrate how many years the nation or a state could continue business as usual with oil and gas activities and can provide a timeline of when regional economic impacts of a leasing pause might be experienced. To estimate the years of drilling opportunities provided by the industry's stockpile of federal non-producing leases and acres we first estimate how many non-producing leases expire and then estimate the years of drilling opportunities provided by the unexpired leases. The analysis does not take into account leases on non-federal lands. Our analysis requires imposing assumptions regarding the age of non-producing leases, drilling intensity, well placement (whether wells are drilled on non-producing or producing leases), and well density. We also presume that existing non-producing federal leases

can produce at similar rates as existing producing federal leases.<sup>13</sup>

Lease age is important to consider, as federal oil and gas leases have a 10-year primary term after which they expire unless a) qualifying drilling is in progress, b) the lease has a well capable of producing in paying quantities, or c) the lease receives allocation of production from an off-lease well (e.g., a well on a neighboring lease is horizontally drilled into the lease area under question).<sup>14</sup> For our purposes we assume if industry begins the process of drilling a well on a non-producing lease this serves to preserve the lease and the lease does not expire. For each region (state or nation) we assume the FY



Photo: Wild Earth Guardians

<sup>13</sup> If non-producing leases are largely not capable of production like producing leases, they would represent significant inefficiencies in the federal leasing program and would further reinforce the notion that federal leasing is not needed and federal reforms to the leasing program are essential. Likewise, if federal leases are largely being purchased by private companies to simply pad asset portfolios and are not intended to be developed, this would be indicative of subsidized rents by U.S. taxpayers and that these public lands should not be leased for oil and gas.

<sup>14</sup> Lease renewals can also be granted and lease suspensions are often granted. For example, in 2015, over 3 million acres of leased land was in suspension and not paying rental fees or royalties.

2020 year-end stockpile of federal non-producing leases ( $NPL_{2020}$ ), and federal non-producing acres ( $NPA_{2020}$ ) contained within these leases, are evenly distributed between 0 and 9 years of age, and thus one-tenth of  $NPL_{2020}$  will expire each year between 2021 and 2030 unless the industry opts to spud wells on the non-producing leases to preserve them.<sup>15</sup> Given the recent stockpiling of federal leases under the Trump Administration, our assumption of evenly distributed lease expirations results in conservative estimates of future drilling opportunities.

Historical well spud data from federal leases is used to estimate low- and moderate-intensity drilling rates for the U.S. and each Intermountain West state. The low and moderate bounds for drilling intensity capture changing market and regional trends and allow for projections of business as usual in modeling future drilling opportunities from non-producing federal leases that are region-specific. For the U.S., low-intensity drilling occurred from 2016-2020 and moderate-intensity drilling occurred from 2009-2014. Because drilling activity is not uniform across the country, different years were used to calculate low- and moderate-drilling intensity for some states.<sup>16</sup> Because well spuds will only preserve  $NPL_{2020}$  if drilled on a non-producing lease, we assume half of new well spuds are drilled on non-producing leases (the other half of new well spuds are drilled on producing leases). Within these constraints we assume industry acts to preserve as many leases as possible, spudding wells on the oldest non-producing leases first. See **Appendix A** for



Photo: Peter Aengst

*This approach suggests federal onshore leases stockpiled by the industry nationwide will yield approximately 75 years of drilling opportunities.*

full methods and formulas used to determine years of drilling opportunity. This approach suggests federal onshore leases stockpiled by the industry nationwide will yield approximately 75 years of drilling opportunities.

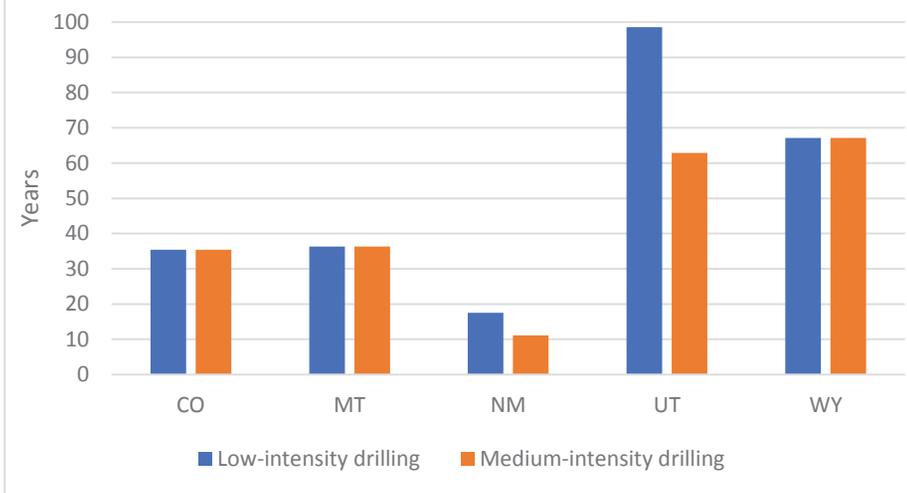
State-level results are presented in Figure 16. Differences in preserved leases and spatial variation in drilling intensity and average well density cause significant variation between states. With notably fewer stockpiled federal leases and higher federal drilling rates than most other Intermountain West states, New Mexico has far fewer years of drilling opportunities (YODO)—between 11 and 18 years. Wyoming has far more non-producing acres than other Intermountain West states. Thus,

even though low-intensity drilling rates are similar in Wyoming and New Mexico and moderate-intensity drilling rates are 30% higher in Wyoming than in New Mexico, we estimate 67 years of drilling opportunities for Wyoming but fewer than 20 years for New Mexico. Montana and Colorado have similar  $NPA_{2020}$  values and similar YODO values (36 and 35 years respectively under both drilling intensities), despite the majority of  $NPA_{2020}$  expiring in Montana but little expiring in Colorado. The similar YODO values result from notably lower drilling rates in Montana. Utah has 1.8 million acres of non-producing federal leases available for production (the second most of the five Intermountain West states) and a much slower rate of oil and gas production when compared to Colorado, New Mexico, or Wyoming. This combination leads to Utah having very large YODO values, with our estimates ranging from 63–98 years.

<sup>15</sup> As noted earlier the  $NPL_{2020}$  values used in our calculations reflect the sum of FY2020 year-end non-producing leases (as published by the BLM) plus all additional leases issued between 10/1/2020 and 5/14/2021.

<sup>16</sup> New Mexico's low-intensity drilling occurred between 2015 and 2018, while high-intensity drilling was from the same as for the U.S., 2009-2014. Colorado's low-intensity drilling years were 2015-2017, and high-intensity drilling occurred between 2012 and 2014. Years used for low- and moderate-intensity drilling for the other three states (Montana, Utah, and Wyoming) were the same as used for the entire U.S.

Figure 16: Years of Drilling Opportunities



Data Source: CEI calculations

In summary, consistent with current production levels, Wyoming and New Mexico are more dependent on federal oil and gas leasing than other Intermountain West states. In Wyoming the industry has stockpiled sizeable quantities of federal oil and gas leases and drilling permits, resulting in nearly 70 years of drilling opportunities. It is important to note that these decades of future drilling opportunities do not account for the many years of drilling opportunities available from existing federal leases that are producing yet not fully developed. The excessive speculative stockpiling

undertaken by the industry in Wyoming is more than sufficient to obviate any impacts from a temporary federal leasing pause on Wyoming's economy.

Industry has fewer non-producing federal leases and acres available for future drilling and development in New Mexico, as most New Mexico federal leases have been put into production. However, the high level of drilling and recent production from private lands in the Permian Basin limits the ability of federal policies to have major implications for New Mexico state annual oil and gas revenues. Despite the abundant private opportunities in New Mexico for oil and gas development, there is still a large supply of federal non-producing acres to provide industry with at least 11 years of drilling opportunities in New Mexico at recent historical rates, without issuing any new federal leases. While careful management and planning by industry and states may be necessary (particularly in New Mexico), our analysis indicates impacts from a federal leasing pause should be negligible.



Photo: BLM

## Rebuttal of the University of Wyoming's Tim Considine Study

The oil and gas industry has a long history of over-estimating jobs associated with extracting oil and gas resources and over-estimating effects from federal policy changes. In this summary box, we illustrate why the latest industry-supported projections associated with permanent bans on federal leasing and drilling, in the form of Dr. Tim Considine's study entitled "The Fiscal and Economic Impacts of Federal Onshore Oil and Gas Lease Moratorium and Drilling Ban Policies,"<sup>1</sup> are not economically credible.

We reviewed the study released on December 14, 2020. The report (hereafter, the Considine study) is fraught with methodological issues that critically undermine the validity of the study. The gold standard in research is reproducibility. Unfortunately, the Considine study is also lacking in methodological transparency, making it irreproducible. The biggest problems with the Considine study methods are:

- There is no apparent inclusion of numerous drilling opportunities in existing non-producing leases (half of all federal leases) in the models and no acknowledgement of stockpiled leases and APDs in the study area. This critical omission casts doubt on all projections.
- Past production from all types of lands (private and federal) is used to model future production on federal lands. A far superior model would distinguish and project the effect of federal policies utilizing data specifically from federal lands.
- Predicted slower growth in baseline future investments is being translated as a "loss of existing jobs" attributable to a ban on federal leasing. However, these are not losses of existing jobs, rather estimated decreases in hypothetical growth.
- There is zero sensitivity analysis around the "central finding" that drilling activity is quite sensitive to price. Year one predicted prices are already completely wrong, only 6 months after the release of the study.
- The effect of modeled market prices for oil and gas have not been isolated from the effects of modeled federal policies, making it impossible to decipher policy effects.
- The Considine study neglects to incorporate basic economic laws of supply and demand. Under the long-term policies modeled in the study, reducing federal production of oil and gas would constrain the total supply. When quantities of supply are reduced, and demand stays the same, there is an increasing effect on price. This positive effect is not accounted for in the Considine study.
- Incorporating multiplier effects into projections that are based on long-term future hypothetical investments, as done in the Considine study, is poor practice and should be replaced with direct employment and value-added. The use of multiplier effects in the Considine study increases the range of confidence intervals beyond the point of usefulness.

<sup>1</sup> <https://www.wyoenergy.org/wp-content/uploads/2020/12/Final-Report-Federal-Leasing-Drilling-Ban-Policies-121420.pdf>.

## 4 Economic Efficiency Analysis of a Federal Leasing Pause

**R**egulating the pace and scale of resource management, such as done by the temporary leasing pause, is not a new concept for limiting negative and unintended consequences. In response to overcutting of our forests, President Teddy Roosevelt's Chief Forester Gifford Pinchot recommended controlling the pace and scale of logging, a practice known as forest regulation. Pinchot's goal was to provide "the greatest good for the greatest number for the longest time." Phased energy development,<sup>17</sup> by incrementally phasing down federal oil and gas leases, simply applies the practice and the long-term goal to the production of oil and natural gas.

Phasing down oil and gas leasing produces immediate benefits, particularly for ecosystem conservation. When initial cutbacks on oil and gas development on federal lands are moderate and only target new leases, such as a federal leasing pause, the correlating costs and employment impacts are likely to be minimal. This is advisable so all stakeholders have sufficient time to plan an economically efficient energy transition.

### 4.1 Benefits of a Leasing Pause

A federal leasing pause, by slowing the pace and scale of leasing, allows time to establish a more fiscally and environmentally responsible approach to oil and gas development on federal lands. A federal leasing pause provides temporary protection to public land not currently leased, while the BLM re-balances its approach to multiple use management. This pause will afford time for critical information collection and can be a catalyst for having public lands lead the national energy and economic course correction necessary in the face of climate change.

#### 4.1.1 Conservation Benefits

The benefits of the leasing pause include the enhanced multiple uses accrued by protecting public land which has high values for wildlife habitat, recreation, potential wilderness, carbon sequestration, and numerous other ecosystem services. In addition to the leasing pause, President Biden's executive orders also included a goal of conserving nearly a third of U.S. land and ocean waters by 2030. An ancillary benefit of a leasing pause is the time it creates for the BLM to evaluate the conservation value of lands currently not leased for meeting that ambitious conservation goal.



Photo: Zach Dischner

<sup>17</sup> Haeefe, M. and P. Morton. 2009. The Influence of the Pace and Scale of Energy Development on Communities: Lessons from the Natural Gas Drilling Boom in the Rocky Mountains, WESTERN ECONOMICS FORUM 8(2):1-42.

Over the last 20 years, 46 million acres of public lands have been leased under the federal oil and gas program, for an annual average of 2.3 million acres leased.<sup>18</sup> Over the last ten years, the annual average of acres leased has been 1.4 million acres. Thus, a leasing pause of up to one year, would save approximately 1.4 million acres from being leased and developed for oil and gas extraction. Even when federal leasing resumes, market conditions and changing federal policy make it likely that a large number of public acres saved from oil and gas leases during a temporary pause will not end up being sold to oil and gas companies.

The ecosystem protection for more than a million acres of public lands that will not be leased to oil and gas companies during a one-year leasing pause, is a boost for conservation efforts and is highly valued by the public, primarily for passive use values of simply knowing that public lands will not be degraded by oil and gas development. Saving 1.4 million acres of public lands from oil and gas leasing results in substantial non-market economic value held by society that could be collected by the federal government and should be included in cost-benefit analyses of federal leasing policy changes.<sup>19</sup>

The resulting improvement in societal welfare, or public willingness-to-pay for conservation, if these public lands remained un-leased for oil and gas, can be estimated using benefit transfer methods. Economists recently estimated the value of ecosystem conservation<sup>20</sup> in a global meta-analysis of willingness-to-pay for protecting landscapes from extractive development, finding within-sample mean predictions of \$230 (in 2021 U.S. dollars) per affected household for the largest landscape preservation example studies. The scale of protection yielded by a federal oil and gas leasing pause represents a much

larger preservation effort than any of the preservation programs included in the utilized meta-analysis estimates,<sup>21</sup> though the public lands saved from leases tend to be less scenic than those lands already protected as National Parks and Wilderness.

Since the leasing pause is focused on federal lands across the U.S. that are publicly owned, the affected households are all U.S. households. Assuming that this newly derived land protection stays in place over time and that at least 10 percent of all U.S. households are willing to pay for this ecosystem protection, a quite conservative measure of WTP for protecting 1.4 million acres of federal lands from oil and gas development is approximately \$3 billion (\$230 x 13 million U.S. households). This value dwarfs the correlating \$78 million in lease sale revenue that occurred in FY 2020 (see next section on Leasing Pause costs).

#### 4.1.2 Information Benefits

Perhaps the greatest benefit of a federal leasing pause is that it allows for information to be collected, studies completed, and decision documents updated, to make more informed policy decisions. In Colorado, Boulder and Rio Grande counties have both used moratoriums on oil and gas development to allow more time for studies to be completed. The length of a federal leasing pause should be based, in part, on the time necessary to update decision documents.

The information to be updated include: 1) a comprehensive review of leasing, permitting and bonding policies; 2) planning information from updating national program documents; 3) scientific information from new studies;

18 <https://www.blm.gov/programs-energy-and-minerals-oil-and-gas-oil-and-gas-statistics>.

19 A recent U.S. Department of Agriculture (USDA) regulatory impact assessment and cost-benefit assessment for the Alaska Roadless Rulemaking (<https://www.fs.usda.gov/roadmain/roadless/alaskaroadlessrule/proposedruledocuments>) provides a representative example of how conservation values, inclusive of non-market passive use values, for protecting public lands from extractive development should be accounted for in overall costs and benefits of a policy proposal. In this example cost-benefit assessment, USDA found that removing Roadless protections from only 168,000 acres of public lands, and making them suitable for timber harvest, would result in approximately \$30 million in foregone conservation value, or societal willingness-to-pay, from Alaskan residents. While public lands saved by an oil and gas leasing pause have different ecosystem attributes as compared to the coastal temperate rainforest being valued in this example, the sheer scale of millions of public land acres annually at stake indicate that the foregone conservation value of not implementing a leasing pause is immense.

20 Hjerpe, E., Hussain, A., & Phillips, S. (2015). Valuing type and scope of ecosystem conservation: a meta-analysis. *Journal of Forest Economics*, 21(1), 32-50.

21 *Ibid.*

and 4) economic information on the regional economic impacts from transitioning away from oil and gas production and economic impacts of alternate land uses. Table 2 summarizes information benefits from using the leasing

pause to review and update policies governing responsible oil and natural gas development on public land.

<b>Table 2. Benefits from Updating Federal Oil and Gas Information and Decision Documents</b>	
<b>Information Updated</b>	<b>Explanation of Benefits</b>
Review and Update Oil and Gas Leasing and Permitting Policies	Identify inefficiencies and revise policies for lease suspensions, rental rates, minimum bids, non-competitive lease sales, and royalty rates.
Review and Update Bonding Policies	Increase bonding amounts to cover the costs of plugging wells and fully restoring the site.
Report on Abandoned, Orphaned and Reclaimed Wells	Estimate costs to plug and reclaim abandoned and orphaned wells leaking methane pollution. Review reclamation success of reclaimed lands. Explore the use of per well impact fees to provide a stable source of funding.
Budget Analysis of Funding Needed to Implement Fiscally and Environmentally Responsible Oil and Gas Development	BLM funding is insufficient to fully implement management plans. Identify budget gaps - underfunded programs in need of budgetary resources and increased staff to implement responsible oil and gas development.
Net Fiscal Impact Statement on Return to Taxpayers	Provide information on net revenue to taxpayers for evaluating fiscal responsibility of BLM's oil and gas program.
Review Regulatory Compliance History	Understand the frequency of waiving and exempting wildlife stipulations and environmental regulations. Identify bad actors based on fines, penalties, spills, unused drilling permits, and non-producing acres.
Cumulative Effects Analysis of Environmental Impacts at Multiple Spatial Scales	NEPA regulations require agencies to quantitatively account for direct effects, indirect effects, as well as cumulative environmental effects. Cumulative effects of the last 20 years of drilling can be examined as part of a PEIS.
Programmatic Environmental Impact Statement (PEIS) of the Federal Oil and Gas Program	A PEIS allows the BLM to examine the oil and gas program in its entirety. The PEIS provides programmatic guidance for preparing resource management plans.
Update Policy for Internalizing Non-market Benefits and Costs in Planning Documents	Methods for utilizing nonmarket environmental benefits and costs in EIS-level NEPA analyses and documents. Guidance should include methods for accounting for the social cost of carbon and methane in decision documents.
Assess Quality of Baseline Data, Monitoring and Enforcement efforts.	High quality data address uncertainties, provide more accurate predictions of environmental impacts and are required to make reasoned analyses in order to decrease environmental risks.
Regional Economic Impacts	Which states and counties will be positively or negatively impacted by a federal leasing pause and down regulating oil and gas development? What transition strategies are available to assist negatively impacted communities and displaced workers?

While production continues from existing leases on public land, Biden’s leasing pause and phasing down of the federal leasing program provides time for the BLM to identify fiscal inefficiencies in the current oil and gas leasing program. For example, the BLM should examine the fiscal consequences of



Photo: Zach Dischner

having millions of acres under lease but not in production, including the acres suspended. In 2015, over 3 million acres of leased land was in suspension and not paying rental fees or royalties, with Intermountain West states having the most suspended leases.<sup>22</sup> Leases can be suspended for permit or environmental reviews, but can often be extended, leaving federal oil and gas leases in limbo—not generating revenue and precluding other uses of these public lands. Bonding amounts can also be examined as research suggests over \$1 billion in legacy costs on federal land from fiscally inefficient bonding policies.<sup>23</sup>

Other glaring fiscal information needs for federal oil and gas programs include how much it cost taxpayers to set up a lease sale. When the BLM leases land for just \$2 per acre, does the lease revenue cover the administrative and oversight costs of the lease sale? Below cost timber sales were a huge issue for the Forest Service back in the 1990s. The same fiscal arguments apply to the BLM setting minimum bids for oil and gas leasing sales at \$2 per acre.<sup>24</sup> To the extent that “below cost leasing” occurs, it represents an implicit subsidy for industry and another focal point of Biden’s Executive Order.

#### 4.1.3 Climate Benefits as Catalyst for a National Course Correction

The Stockholm Environment Institute estimates that to meet climate goals, oil and gas production has to decrease 6 percent per year.<sup>25</sup> Because reducing the production and consumption of oil and gas is necessary for the U.S. to meet its climate goals, the leasing pause for public land is an essential first step. While a short-term, temporary leasing pause is unlikely to slow oil and gas production and associated emissions, it does generate climate benefits as a symbolic catalyst for a national course correction necessary to address the

22 United States Government Accountability Office. (2018). Oil and Gas Lease Management: BLM Could Improve Oversight of Lease Suspensions with Better Data and Monitoring Procedures. GAO-18-411.

23 Morton, P., J. Kerkvliet and E. Hjerpe. Impact Fees, Bonding Reform and Oil and Gas Development. Forthcoming. Colorado Natural Resources, Energy, & Environmental Law Review. Volume 32, Issue 1. University of Colorado Law School, Boulder, CO.

24 Morton, P., J. Kerkvliet and E. Hjerpe. (2015). Comments on BLM’s Advanced Notice of Proposed Oil and Gas Rulemaking. Conservation Economics Institute. 31p. ([https://421f7795-9db7-4104-9a85-bd2dfc6dea3e.filesusr.com/ugd/5fc209\\_04dbabc73baa4948ac77b21658f3af70.pdf](https://421f7795-9db7-4104-9a85-bd2dfc6dea3e.filesusr.com/ugd/5fc209_04dbabc73baa4948ac77b21658f3af70.pdf)).

25 SEI, IISD, ODI, E3G, and UNEP. (2020). The Production Gap Report: 2020 Special Report. <http://productiongap.org/2020report>

realities of our changing climate. A federal leasing pause sends a signal to the marketplace and to companies that the Administration is serious about transitioning our economy by reducing pollution and our dependency on oil and gas. A federal leasing pause provides a “test run,” for companies to prepare for the significant course correction necessary to transition our economy to cleaner and renewable sources of energy.

A federal leasing pause can also be a catalyst for demonstrating an economic transition from oil and gas industries into greener industries. That is, the Administration can help federal lands play a leading role in being an exemplary model for hastening an energy transition while limiting and offsetting adverse effects.

## 4.2 Costs of a Leasing Pause

The costs of a federal leasing pause can be primarily boiled down to lost lease sale revenue, inclusive of bonus bids, first year rentals, and administrative fees. While royalties may be affected in a few years if a temporary leasing pause were extended into the future, the short-term effect of a federal leasing pause will only be lost lease revenue. Federal lease revenue goes to the U.S. Treasury, with approximately half being returned to the states where the covered acreage is located. Lease revenue is a small part of the federal revenue from oil and gas development, which is dominated by royalty payments. Lease revenue represents the payment, essentially the same as rent, to U.S. tax holders for allowing oil and gas development on public lands.

FY 2020 total receipts from competitive oil and gas sales on federal lands were \$78 million.<sup>26</sup> In FY 2020, 5.3 million acres of federal lands were offered for sale, while 1.87 million acres were issued in federal leases. The \$78 million can be considered as the national costs coming from the leasing pause if we assume that FY 2020 is representative of near-term future leases that would have been sold without a federal leasing pause, though DOI has discretion on limiting lease sales. These costs are dwarfed by the conservation benefits

(conservatively estimated at \$3 billion) indicating that overall national benefits of a federal leasing pause outweigh the costs by almost 40 times.

If the leasing pause encourages industry to increase production on federal non-producing acres or increase wells on federal producing acres, as is likely the case, revenue losses from lease sales will be more than offset by an increase in federal royalties. This appears to be partially the case in New Mexico, which set production and revenue records in 2020, despite shutting in more than 4000 wells due to the pandemic. The increase in marginal revenue from increasing production on leases will minimize the loss of leasing revenue from a federal leasing pause. Likewise, a phasing down of federal oil and gas leasing will also incentivize greater investments on state and private lands, likely increasing royalties and rents from non-federal lands.

<sup>26</sup> BLM Oil and Gas Statistics, Competitive Oil and Gas Lease Sales. BLM Oil and Gas Statistics, Competitive Oil and Gas Lease Sales. Lease receipts are inclusive of bonus bids, first year rentals, and administrative fees. FY 2019 total receipts from competitive oil and gas lease sales were \$219 million.

# 5 Energy and Economic Transition in the Rural Intermountain West

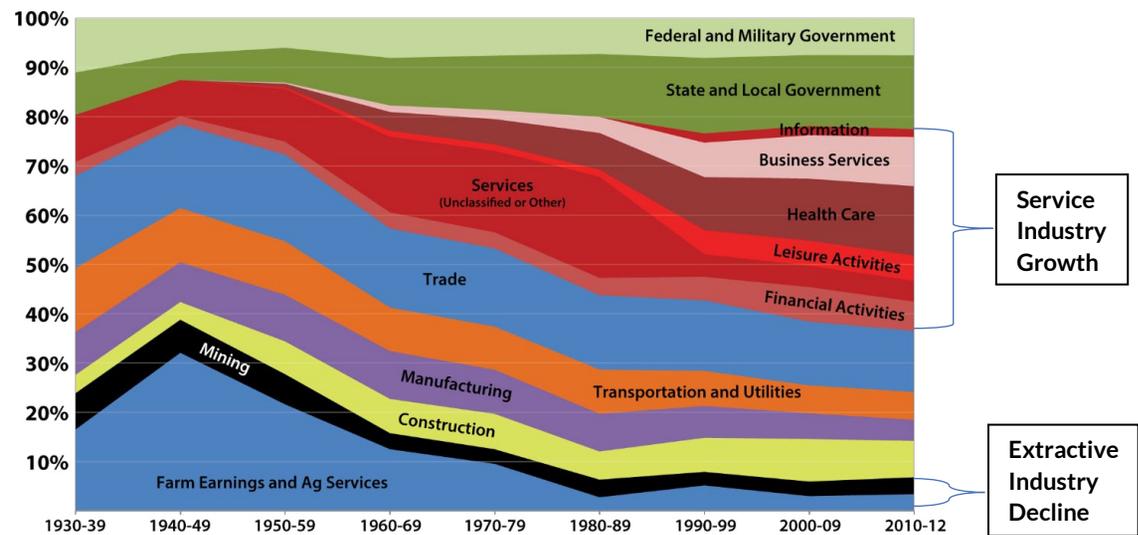
In this section we look to future development of rural communities in the Intermountain West and investigate a transition plan for regions most dependent on federal oil and gas production. We start by illustrating the economic restructuring that has been widespread in the rural Intermountain West that affords rural communities greater economic development opportunities than in the past. A pause in federal leasing can build on the existing restructuring by laying the groundwork for the transition to a clean energy economy that itself will provide opportunities to diversify the broader economy in ways that can benefit the communities impacted by shrinking oil and gas sector activity. Then, we offer a transition approach for cleaning the legacy and existing supply-chain of oil and gas that can provide high paying jobs targeted to workers with similar skill sets as found in oil and gas development.

## 5.1 The Leasing pause and Diversified Rural Economic Development

Over the last four decades, there has been a structural economic change in the rural West as extractive industries, agriculture, and manufacturing have given way to service industries (see Figure 17 for Montana example which is illustrative of all five Intermountain West states).<sup>27</sup> These service industries include typical tourism sectors such as lodging, restaurants, and outfitting but also include many high-wage service industries such as financial, medical, and professional services. Instead of

traditional migration, where people followed jobs and were focused primarily on increasing wages and wealth, amenity migration began in earnest in the 1980s when many migrants started to pursue greater quality of life that focused on environmental quality and outdoor recreational activities, especially those provided by public lands.<sup>28</sup> Recent research demonstrated that public lands with greater protection were positively associated with greater migration rates and that oil and gas dependent counties in the rural West were negatively associated with migration rates from 1980-2010.<sup>29</sup> In other words, conservation attracts people and businesses; intensive oil and gas development repels people and businesses over the long run.

Figure 17: Share of Montana Personal Income by Industry



Source: Montana Department of Labor and Industry, Research and Analysis Bureau; Author: Barbara Wagner, ([https://mslservices.mt.gov/legislative\\_snapshot/Economy/Default.aspx](https://mslservices.mt.gov/legislative_snapshot/Economy/Default.aspx)).

27 Beyers, W. B., & Nelson, P. B. (2000). Contemporary development forces in the nonmetropolitan West: New insights from rapidly growing communities. *Journal of rural studies*, 16(4), 459-474.

28 Power, T. M. (1996). *Lost landscapes and failed economies: The search for a value of place* (Vol. 38). Washington, DC: Island Press.

29 Hjerpe, E., Hussain, A., & Holmes, T. (2020). Amenity migration and public lands: Rise of the protected areas. *Environmental management*, 66(1), 56-71.

From a regional perspective, a pause in federal leasing for oil and gas can spur local research, policies, and strategies to generate more sustainable and diversified rural economic development. In Western rural regions with little economically recoverable oil and gas resources, more sustainable economic development has largely already occurred in the form of conservation-based amenity development. The resulting high-wage information and service jobs represent an infilling of communities adjacent to public lands.

*... conservation attracts people and businesses; intensive oil and gas development repels people and businesses over the long run.*

For regions with economies more dependent on oil and gas extraction, a leasing pause on federal leasing will have little effect on employment totals in the near-term and will provide an impetus for using local public lands for non-extractive multiple uses. Part of this regional economic transition will require protecting remaining public lands nearby that have not been developed for oil and gas and envisioning development strategies for these conservation lands (e.g., increased tourism, fishing, hunting, off-road riding, mountain biking, nature viewing, etc.) while increasing environmental protections. Oil and gas dependent counties in the Intermountain West tend to have less amenity migration and development in part because oil and gas development has precluded these regions from diversifying into conservation-based, or conservation-enhanced, development options.

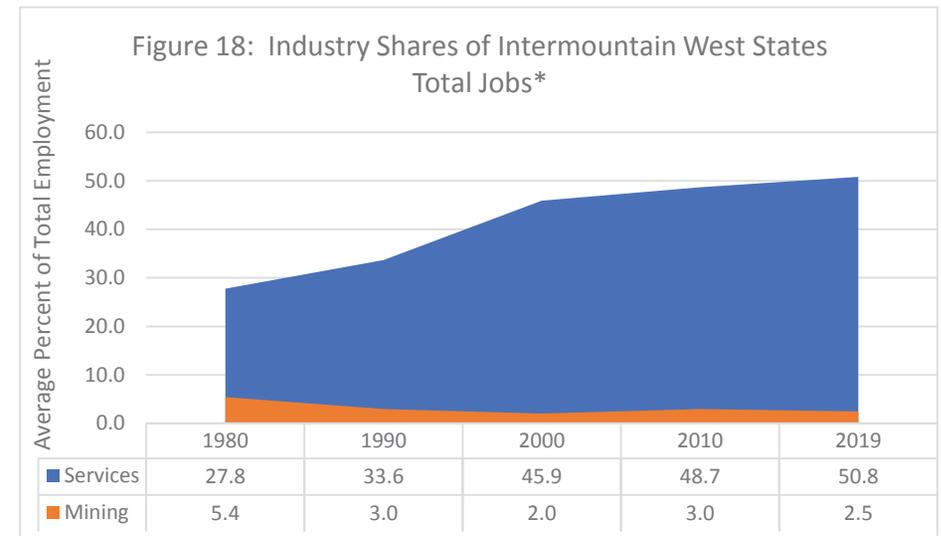
## 5.2 Economic Transition and the Resource Curse in the Intermountain West

Amenity migration was largely spurred by retirees with non-labor and transfer income and entrepreneurs, with both groups attracted to the suite of ecosystem services offered by protected public lands.<sup>30</sup> This amenity development flipped the traditional economic script for many rural Western communities—where businesses looked to invest in the conservation and sustainability of a region as opposed to investors aiming to extract resources

and profit from the land.

While amenity migration and development influenced the widespread economic structural change in the rural West, changing perceptions and economic shortcomings of extractive industries also played a large role in economic restructuring. With numerous extractive industry busts and decreasing social acceptance of liquidating non-renewable resources and associated air and water pollution, concerns over resource extraction on public lands grew. Concurrently, technological advances in

resource extraction steadily decreased the number of jobs needed per unit of extraction. Figure 18 illustrates the average percent of total employment for all five of our focal Intermountain West states, comparing service sector employment growth with oil and gas employment decline.



\*\*“Mining” includes oil and gas sectors. Data Source: U.S. Regional Economic Analysis Project ([https://united-states.reaproject.org/analysis/industry-structure/industries\\_by\\_region/employment/](https://united-states.reaproject.org/analysis/industry-structure/industries_by_region/employment/)).

Some of the regional economic problems with intensive oil and gas development are captured by the phenomenon known as the “resource curse”

<sup>30</sup> Rasker, R., & Hansen, A. (2000). Natural amenities and population growth in the Greater Yellowstone region. *Human Ecology Review*, 30-40.

which has been associated with numerous oil and gas producing countries and regions, including Intermountain West states such as Wyoming.<sup>31</sup> The “resource curse” happens when resource dependence depresses long-term GDP growth relative to diversified economies.<sup>32</sup> Broader versions of the “resource curse,” or the notion that places with abundant resource extraction are paradoxically impoverished at both environmental and socio-economic scales,<sup>33</sup> have also identified greater social problems associated with boom and bust cycles of unconventional oil and gas development, such as increased crime<sup>34</sup> and a lack of municipal funds to cover the emergency and social services needed.<sup>35</sup> For example, Intermountain West counties with longer duration of oil and gas specialization were associated with higher crime rates, long-term per capita income declines, and lower educational attainment rates.<sup>36</sup> The quick wealth from resource extraction also encourages corruption and “rent seeking”—where rent seeking is defined as resources spent on getting political favors. Papyrakis and Gerlagh<sup>37</sup> found that resource reliance is correlated with an increasing number of public officials prosecuted for corruption.

Increasing oil and gas well density displaces other uses and users, like outdoor recreation, becoming the sole use in some “multiple use” public lands.<sup>38</sup> Research has verified that oil and gas development is incompatible with tourism and recreation, showing that public lands with oil and gas

wells incur less visitation and recreation than similar public lands without oil and gas infrastructure.<sup>39</sup> Oil and gas development can also crowd out other businesses and entrepreneurs,<sup>40</sup> opportunity costs seldom discussed in rural development strategies.

While there are certainly positive economic effects from oil and gas development during boom periods, such as increases in jobs, royalties, and taxes, the comprehensive research discussed above illustrates how long-run community well-being can be diminished in regions dependent on oil and gas production and how these short-term positive economic effects typically are not enough to cover the long-term negative effects. Alternately, outdoor recreation has been shown to be the most sustainable form of public lands development.<sup>41</sup> Local development strategies must be better informed with the full economic picture, beyond simple economic metrics of wages, jobs, and tax revenues.

The COVID-19 pandemic has intensified the shift from primary extraction and manufacturing to service industries and amenity development. For example, Wyoming has experienced nearly 68% less revenue from the mining sector, in the form of sales and use taxes, during 2020 as compared to 2019.<sup>42</sup> Meanwhile, rural communities with attractive natural amenities have seen a dramatic increase in economic demand, especially as more and more

31 James, A. & Aadland, D. (2011). The curse of natural resources: an empirical investigation of U.S. counties,” *Resource and Energy Economics*, 33, 440–453.

32 Haggerty, J., Gude, P. H., Delorey, M., & Rasker, R. (2014). Long-term effects of income specialization in oil and gas extraction: The U.S. West, 1980–2011. *Energy Economics*, 45, 186-195.

33 E.g., Mayer, A., Olson-Hazboun, S. K., & Malin, S. (2018). Fracking fortunes: economic well-being and oil and gas development along the urban-rural continuum. *Rural Sociology*, 83(3), 532-567.

34 Komarek, T. M. (2014). Crime and natural resource booms: Evidence from unconventional natural gas production. *The Annals of Regional Sciences*, 1-25.

35 Morton, P., J. Kerkvliet and E. Hjerpe. Forthcoming. Impact Fees, Bonding Reform and Oil and Gas Development. Colorado Natural Resources, Energy, & Environmental Law Review. Volume 32, Issue 1. University of Colorado Law School, Boulder, CO.

36 Haggerty, J., Gude, P. H., Delorey, M., & Rasker, R. (2014). Long-term effects of income specialization in oil and gas extraction: The U.S. West, 1980–2011. *Energy Economics*, 45, 186-195.

37 Papyrakis, E. and R. Gerlagh. (2007). Resource Abundance and Economic Growth in the United States. *European Economic Review*. 51: 1011-1039.

38 Loomis, J. B., Kerkvliet, J., & Weiler, S. (2007). Are High Wage Jobs Hazardous to Your Health? The Myth That Attracting Higher Paying Extractive Industry Jobs Is a Desirable Community Economic Development Strategy. In *Western Economics Forum* (Vol. 6, No. 1837-2016-151766, pp. 10-14).

39 Rasch, R., Reeves, M., & Sorenson, C. (2018). Does oil and gas development impact recreation visits to public lands? A cross-sectional analysis of overnight recreation site use at 27 national forests with oil and gas development. *Journal of outdoor recreation and tourism*, 24, 45-51.

40 Weber, Jeremy G. 2013. “ In the Good Times and the Bad: Shale Gas Development and Local Employment.” *Rural Connections* 7(2): 33– 36.

41 Hjerpe, E. E. (2018). Outdoor recreation as a sustainable export industry: A Case Study of the Boundary Waters Wilderness. *Ecological Economics*, 146, 60-68.

42 [https://trib.com/business/energy/wyomings-mining-industry-still-suffers-as-economy-slowly-recovers-new-report-shows/article\\_18823bcb-f3a8-52b2-be9f-cc4ec926af54.html](https://trib.com/business/energy/wyomings-mining-industry-still-suffers-as-economy-slowly-recovers-new-report-shows/article_18823bcb-f3a8-52b2-be9f-cc4ec926af54.html).

people have begun working remotely and fleeing to less crowded areas.<sup>43</sup> While excessive amenity development can be too much of a good thing, such as that seen in oft cited expensive gateway communities like Aspen, Colorado and Jackson, Wyoming, the diversification of regional economies away from primary extraction and manufacturing provides improved economic metrics and greater environmental sustainability.<sup>44</sup>

In summary, research illustrates that rural economic development strategies based on oil and gas development is fraught with volatility and tends to leave communities economically worse off than places less dependent on oil and gas revenues. Combined with the perils of the resource curse, is the fact that economic restructuring in the rural West is providing numerous employment growth opportunities in high-wage service sectors. An extended pause in federal oil and gas leasing can offer rural communities greater opportunities for amenity development and conservation, which can lead to attracting migrants that want to stay in the region to help protect ecosystem services and build sustainable communities.

### 5.3 Energy Transition Strategies and Emissions Reductions

A prominent transition strategy for oil and gas dependent regions is to locate renewable energy projects near affected communities interested in diversifying their energy supply and creating jobs to help them economically transition away from dependency on oil and gas production. Federal oil and gas leasing reform can be paired with legislation such as the Public Land Renewable

Energy Development Act<sup>45</sup> where federal lands are used for siting renewable energy projects and shared revenues can be directed to the most affected regions. Siting of renewable energy projects on federal lands is already occurring and can be ramped up to be an employment bridge for affected oil and gas workers. As of 2019, there are almost 100 utility-scale solar, wind, and geothermal projects on public lands that have a generating capacity of more than 5,000 megawatts and have supported more than 13,000 construction and maintenance jobs.<sup>46</sup>

Other transition strategies for oil and gas dependent regions should be based on cleaning and reclaiming legacy infrastructure, through plugging and proper decommissioning of wells, that have been abandoned, orphaned, or idled for too long. Plugging abandoned wells allows for methane capture and site restoration of legacy oil and gas infrastructure. Eliminating methane leaks and reducing methane waste in existing oil and gas production should also be a primary transition strategy.

Methane is a greenhouse gas about 28 times more potent than carbon dioxide over a 100-year timeframe but even more potent (84 times) over a 20-year timeframe.<sup>47</sup> Methane pollution accounts for nine percent of all U.S. greenhouse gas emissions and almost one-third of that is estimated to come from oil and gas operations.<sup>48</sup> In addition to methane pollution, the Government Accountability Office (GAO) estimated taxpayers lose as much as \$23 million in royalty revenues each year when natural gas is wasted.<sup>49</sup> Given the role of oil and gas operations in contributing to methane emissions, we provide

43 <https://www.usnews.com/news/cities/articles/2021-01-22/influx-of-new-residents-brings-changing-vibe-to-western-cities>.

44 Hjerpe, E., Armatas, C., Haefele, M. (In Review). Amenity development and protected areas in the American West. *Land Use Policy*.

45 <https://www.doi.gov/oc/pendig-legislation-17>.

46 Springer, N. and A. Daue. 2020. Key Economic Benefits of Renewable Energy Development on Public Lands. 32 p. ([www.wilderness.org/renewableenergyreport](http://www.wilderness.org/renewableenergyreport)).

47 Myhre, G., D. Shindell, F.-M. Bréon, W. Collins, J. Fuglestedt, J. Huang, D. Koch, J.-F. Lamarque, D. Lee, B. Mendoza, T. Nakajima, A. Robock, G. Stephens, T. Takemura and H. Zhang, 2013: Anthropogenic and Natural Radiative Forcing. In: *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

48 “2016 Waste Prevention Rule”. 81 Fed. Reg. 83,008 (Nov. 18, 2016). Bureau of Land Management.

49 GAO-11-34. Federal Oil and Gas Leases: Opportunities Exist to Capture Vented and Flared Natural Gas, Which Would Increase Royalty Payments and Reduce Greenhouse Gases. (<https://www.gao.gov/assets/gao-11-34.pdf>).

a close examination of transition strategies focused on cleaning legacy and existing oil and gas infrastructure in the next two sections.

### 5.3.1 Plugging Abandoned Wells

Proposals to reduce or even eliminate oil and gas development on public lands are often met with concern about lost jobs and the cost to adjacent communities. Recent research indicates that displaced workers can remain employed in the industry working to plug abandoned and orphaned oil and gas wells that are no longer producing,<sup>50</sup> and that these activities will produce benefits for society in terms of reduced greenhouse gas emissions, particularly reduced methane emissions.

Wells that are abandoned and unplugged are those which are no longer producing economic quantities of oil or gas, but which have not been properly sealed. Some of these wells have no known operator or owner and are called “orphan wells.” Table 3 compiles recent estimates of the total number of unplugged abandoned wells. Estimates vary widely. The lowest estimate, from the Interstate Oil and Gas Compact Commission (IOGCC),<sup>51</sup> includes only *documented* unplugged orphaned wells (wells with no known owner/operator that are no longer producing oil and gas), but the IOGCC notes that some states have estimated additional orphaned wells and that some oil and gas producing states did not submit estimates for that report. Both Resources for the Future<sup>52</sup> and Carbon Tracker<sup>53</sup> report estimates of wells based on information from the IOGCC combined with other estimates that include additional orphan wells that have not been formally documented along with unplugged abandoned wells with known operators.

Table 4 summarizes recent estimates of the per-well cost of plugging oil and gas wells that are no longer producing. Carbon Tracker’s upper end cost estimate (\$300,000) is more than 3 standard deviations from the mean value, indicating that it can be considered an outlier. For our analyses, we have dropped this value from our calculated mean and subsequent employment estimates.

**Table 3: Estimated Number of Unplugged Oil and Gas Wells**

Source	Estimated number of wells
Interstate Oil and Gas Compact Commission	56,600
Energy Information Administration <sup>1 a</sup>	531,517
Resources for the Future <sup>b</sup>	2,100,000
Environmental Protection Agency <sup>2</sup>	1,986,539
Carbon Tracker	3,300,000-4,000,000
<b>Average</b>	<b>2,288,628</b>

<sup>a</sup> The EIA numbers shown are wells producing below 10 barrels per day (or equivalent for gas). These quantities are likely so small they are only economically feasible because the cost to plug and abandon the well is greater than the operating cost (Raimi et al. 2021).

<sup>b</sup> Per Raimi et al. 2020 this is the EPA estimate of unplugged abandoned wells.

1 EIA, 2020. The Distribution of U.S. Oil and Natural Gas Wells by Production Rate <https://www.eia.gov/petroleum/wells/>.

2 EPA, 2021. “Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2019,” Washington, D.C., 2021, <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2019>

50 Pollin, R., Chakraborty, S., and Wicks-Lim, J. 2021. Employment Impacts of Proposed U.S. Economic Stimulus Programs: Job Creation, Job Quality, and Demographic Distribution Measures. University of Massachusetts, Amherst, Political Economy Research Institute. 70 p.

51 Interstate Oil and Gas Compact Commission (IOGCC), 2019. Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategy. 68 p. <https://iogcc.ok.gov/idle-and-orphan-wells> (accessed 4/20/2021).

52 Raimi, D., N. Nerurkar, and J. Bordoff. 2020. Green Stimulus for Oil and Gas Workers: Considering a Major Federal Effort to Plug Orphaned and Abandoned Wells. Report from Center on Global Energy Policy and School of International and Public Affairs (both Columbia University) and Resources for the Future (RFF). 27 p. <https://www.energypolicy.columbia.edu/research/report/green-stimulus-oil-and-gas-workers-considering-major-federal-effort-plug-orphaned-and-abandoned>.

53 Schuwerk, R. and G. Rogers. 2020a. It’s Closing Time: The Huge Bill to Abandon Oilfields Comes Early. Report: Carbon Tracker Report, 45 p. <https://carbontracker.org/reports/its-closing-time/>

**Table 4: Estimated Costs of Plugging Abandoned Oil and Gas Wells**

Source	Lower (per well)	Upper (per well)
Resources for the Future (2020) <sup>1</sup>	\$24,000	\$48,000
Raimi et al. (2021) <sup>2</sup>	\$20,000	\$76,000
GAO (2019) <sup>3</sup>	\$20,000	\$145,000
Carbon Tracker <sup>4</sup>	\$30,000	\$300,000
Well Done Foundation <sup>5</sup>	\$30,000	
Kang et al. (2019) <sup>6</sup>	\$37,000	
<b>Average (dropping outlier)</b>	<b>\$47,778</b>	

1 Raimi et al. 2020.

2 Raimi, D., Krupnick, A. J., Shih, J., Thompson, A. 2021. Decommissioning Orphaned and Abandoned Oil and Gas Wells: New Estimates and Cost Drivers. ChemRxiv. Preprint. <https://doi.org/10.26434/chemrxiv.14378483.v1>

3 U.S. Government Accountability Office. 2019. Report to Congressional Requesters, Oil and Gas: Bureau of Land Management Should Address Risks from Insufficient Bonds to Reclaim Wells. September 2019. 34 p.

4 Schuwerk, R. and G. Rogers. 2020a.

5 Well Done Foundation: <https://welldonefoundation.com/>

6 Kang, M., Mauzerall, D.L., Ma, D.Z., and Celia, M.A. 2019. Reducing methane emissions from abandoned oil and gas wells: Strategies and costs. *Energy Policy*, 132: 594-601.

Two recent reports have estimated the employment impacts of plugging oil and gas wells. The report from Resources for the Future estimated the average number of job-years (i.e., one full-time equivalent job for one year) per well at 0.24. Multiplying these job-years by the average number of wells shown in Table 3 (2,288,628) provides a total of 550,000 job-years. A report for the Political Economy Research Institute<sup>54</sup> uses economic impact analyses to estimate 7.1 direct jobs per \$1 million in spending on plugging oil and gas wells and 85,200 jobs per year over ten years (or 852,000 job-years).

54 Pollin, R., Chakraborty, S., and Wicks-Lim, J. 2021. Employment Impacts of Proposed U.S. Economic Stimulus Programs: Job Creation, Job Quality, and Demographic Distribution Measures. University of Massachusetts, Amherst, Political Economy Research Institute. 70 p.

55 Pollin et al. 2021.

Raimi et al. (2020) compile several estimates of annual per well methane emissions which range from 0.03 metric tons to 0.19 metric tons. We use the average of these—0.11 metric tons per year per well—along with the average number of abandoned wells (from the studies described in Table 3) to estimate total annual methane emissions of 251,749 metric tons from unplugged abandoned oil and gas wells.

### 5.3.2 Reducing Methane Waste from Existing Oil and Gas Production

While addressing legacy wells can play a large role in cleaning up long-term oil and gas emissions, reducing methane waste from existing production of oil and gas on federal lands should also play a large role in stimulus job creation and emissions reductions. Leak detection and repair (LDAR) is a means to stop excessive wasting of gas that can create numerous jobs and can reduce emissions. Additionally, limiting intentional venting and flaring from oil and gas wells can drastically reduce methane waste.

Pollin et al.<sup>55</sup> include estimates of jobs needed for leak repairs on pipelines only, with direct jobs only at 1.1 per million dollars of spending, but 8.6 total jobs (including direct, indirect, and induced jobs) per million dollars of output. However, they show that leak detection and repair jobs are of high quality (Table 6A from Pollin et al.), illustrating that these jobs have the highest average total compensation (\$152,000) of all analyzed stimulus jobs and have the highest rates of provided health insurance and retirement benefits. The direct jobs needed for leak repairs on existing oil and gas wells, gathering facilities, and pipelines far exceeds the estimates provided for just focusing on pipelines.

Aggressively reducing methane waste from existing oil and gas production is an excellent transition strategy for affected communities. Frequent monitoring and plugging leaks can help reverse the downward trend in oil and gas

jobs from labor saving technology by increasing the jobs per barrel of oil and mcf of gas produced.<sup>56</sup> Eliminating leaks at well pads and maintaining pipelines creates a constant need for local blue-collar jobs similar to plumbers sealing leaks in water pipes. In regions more dependent on federal oil and gas production, such as Wyoming and New Mexico, these transition jobs will be an important part of stimulus aimed at easing any job displacement that may occur if a federal leasing pause is extended.



Photo: Sarah Craig

<sup>56</sup> Morton, P. and Hjerpe, E. 2016. A Review of the Economic Factors Surrounding the Capture of Methane from Oil and Natural Gas Development on Federal Public Land. CEI Research Report, 27p., [https://421f7795-9db7-4104-9a85-bd2dfc6dea3e.filesusr.com/ugd/5fc209\\_59c6d0e608554ac98fd5ac9b4655fad1.pdf](https://421f7795-9db7-4104-9a85-bd2dfc6dea3e.filesusr.com/ugd/5fc209_59c6d0e608554ac98fd5ac9b4655fad1.pdf).

## 6 Conclusions

It must be recognized that very little employment in the West is coming from the oil and gas sector. The main drivers of economic development are the region's natural amenities (i.e., clean air and water, outdoor recreation, scenic beauty, wildlife) with job growth coming from other sectors (e.g., health care, outdoor recreation, information services). Many communities will benefit economically from a leasing pause, as it conserves the natural amenities important for their economies that are responsible for driving population growth to rural communities in the Intermountain West. Additionally, a leasing pause only limits new leasing on federal lands—still allowing continued production from existing and new wells on the millions of acres of public land already under lease.

Any negative employment impacts of an extended leasing pause, or a long-term decrease in oil and gas development on federal lands, will be reserved for the few counties that are heavily dependent on oil and gas from federal lands and should guide federal stimulus efforts. In terms of future state revenues and a phasing down of federal oil and gas leasing, most Intermountain West states are well positioned, through stockpiled federal leases and private opportunities, to weather decreases in new federal leases. Our national and regional analysis indicate that drilling opportunities are not scarce, as industry has millions of acres of public land under lease but not in production. The supply of leased acres means that there will be virtually no short-term effects on oil and gas jobs and production due to a federal leasing pause. Industry has

had 100 years to lease public land and has already leased the most economic parcels of land. Based on declining economic demand for federal leases, the oil and gas resources that remain on federal lands are largely speculative and uneconomic prospects, with limited potential for oil and gas development and greater potential for other uses and supporting other critical values.

Given the local air and water pollution,<sup>57</sup> the harmful effects on wildlife through habitat fragmentation and sedimentation,<sup>58</sup> the general disruption of local ecosystem services,<sup>59</sup> and the adverse socio-economic topics discussed previously (e.g., the resource curse and the lack of sustainability), oil and gas development on public lands is certainly not a regional economic panacea and is actually detrimental to long-term economic development. A federal leasing pause not only provides the federal government time to better plan our energy production on public lands, but importantly, also allows oil and gas dependent communities time to understand and plan for their economic development futures.

57 E.g., Kerkvliet J. and P. Morton. 2019. Assessing the Costs of Air Pollution from Unconventional Oil and Gas Development, Research Report. Conservation Economics Institute. ([https://421f7795-9db7-4104-9a85-bd2dfc6dea3e.filesusr.com/ugd/5fc209\\_51a3db472aff431db9c707800c8f918d.pdf](https://421f7795-9db7-4104-9a85-bd2dfc6dea3e.filesusr.com/ugd/5fc209_51a3db472aff431db9c707800c8f918d.pdf)).

58 E.g., Sawyer, H., Lindzey, F., McWhirter, D., & Andrews, K. (2002). Potential effects of oil and gas development on mule deer and pronghorn populations in western Wyoming. *U.S. Bureau of Land Management Papers*, 5; Copeland, H. E., Doherty, K. E., Naugle, D. E., Pocerwicz, A., & Kiesecker, J. M. (2009). Mapping oil and gas development potential in the U.S. Intermountain West and estimating impacts to species. *PloS one*, 4(10), e7400; Brittingham, M. C., Maloney, K. O., Farag, A. M., Harper, D. D., & Bowen, Z. H. (2014). Ecological risks of shale oil and gas development to wildlife, aquatic resources and their habitats. *Environmental science & technology*, 48(19), 11034-11047.

59 E.g., McClung, M. R., & Moran, M. D. (2018). Understanding and mitigating impacts of unconventional oil and gas development on land-use and ecosystem services in the U.S. *Current Opinion in Environmental Science & Health*, 3, 19-26.

# Case Study Exploring a Transition Away from Federal Oil and Gas Development: A Case Study of Mesa County, CO

Our report is mostly focused on the immediate effects of a temporary pause in federal oil and gas leasing. To envision a broader transition away from fossil fuel development on federal lands, we investigate one county that typifies a rural, but rapidly growing, Intermountain West region that has ample natural amenities and federal lands that are used for both fossil fuel production and outdoor recreation and tourism. We follow with a close-up of Wyoming, as an illustration of Intermountain West regions that have a high dependency on federal oil and gas production but are not experiencing widespread amenity migration.

## Mesa County, Colorado

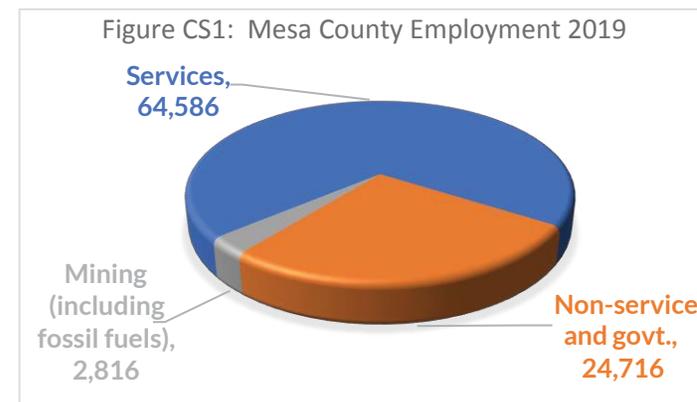
Mesa County (population about 150,000) is in Western Colorado and is home to Grand Junction, one of the region's largest cities, containing about half of the county residents. Mesa County also contains numerous public lands and natural amenities including Grand Mesa, the Colorado National Monument, and world class mountain biking opportunities.

Mesa County's proximity to other destinations in Colorado and Southern Utah, along with convenient access to the region via a regional airport and Interstate 70, help to further attract visitors and migrants. Figure CS1 shows



Colorado and Mesa County (Source: Wikipedia)

the employment totals for services, non-service/government, and mining (including fossil fuels) in Mesa County, which respectively account for 70%, 27%, and 3% of total county employment.



Source: BEA, Regional Economic Accounts

## Importance of Federal Land for Outdoor Recreation and Tourism in Mesa County

Mesa County is one of the largest counties in Colorado, with over two million acres. Much of this land is federal (about 73%), with the Bureau of Land Management (BLM) managing 46% of county land and the U.S. Forest Service (USFS) managing 26%. While the BLM public lands have provided substantial oil and gas production, Mesa County also has many protected areas, including more than 100,000 acres of Wilderness, almost 300,000 acres of inventoried Roadless areas, and a prominent National Monument adjacent

to a large population center.<sup>60</sup> With ample protected areas, and other public lands available for motorized and mechanized recreation, Mesa County has been able to attract migrants and has diversified its economic portfolio, allowing for a smooth transition out of oil and gas development on public lands.

While public lands attract numerous visitors to Mesa County, these protected and recreational areas also attract entrepreneurs, retirees, and businesses to permanently relocate to the region. Recent research has shown that Mesa County had an average decadal in-migration rate of 14% from 1980-2010, ranking 62<sup>nd</sup> out of 356 Western rural counties in terms of highest average in-migration rates.<sup>61</sup> In terms of the level of amenity development, inclusive of migration rates, housing prices, and seasonal housing, Mesa County ranks 118th out of 356 rural Western counties, placing it in the top 33% of Western rural counties with the highest levels of amenity development. This indicates that Mesa County is becoming a destination for amenity migrants, but that housing prices are still affordable in relative comparison to the most amenity developed rural counties.

Taxes are important revenues for rural counties and are used to support infrastructure, emergency services, schools, and county planning. Both tourism and amenity migration play an important role rural tax revenue. Visitor taxes are mainly collected as sales and lodging taxes. On the other hand, residents are charged property taxes (in addition to sales taxes) that increase as the economic demand for relocating to Mesa County increases. Thus, amenity migration and development exponentially boost property taxes by increasing the market price for living in Mesa County. Limiting oil and gas development on federal lands will further increase the economic demand for living in Mesa County by boosting conservation and outdoor recreation opportunities.

In terms of tourism, revenues and taxes are rapidly increasing in Mesa County. In 2018, Mesa County broke records in their tourism revenue, with an influx of \$311 million that generated \$87 million in tax revenue.<sup>62</sup> Residential properties accounted for almost 40% of assessed taxable values in Mesa County in 2019, registering over \$1 billion and leading to about \$10 million in county property tax revenue.<sup>63</sup> Additionally, county payments from the federal government totaled over \$4 million in 2019, with payments in lieu of taxes (PILT) accounting for 90%, and Forest Service Secure Rural Schools (SRS) funds accounting for the rest.<sup>64</sup> With 1.6 million acres of federal lands, and moderate population, Mesa County received the most PILT revenue of any Colorado County in 2020.<sup>65</sup>

### Importance of federal land for oil and gas development in Mesa County

Natural gas is the primary commodity in the Piceance Basin, though there are vast deposits of oil shale that are being explored. While Mesa County federal lands are almost three-fourths of all county land, these federal lands only account for one-third of the county's total oil and gas production (see Figures CS2 and CS3).

60 All data for public lands, migration, and amenity development come from CEI's county database on federal lands and natural amenities. See Hjerpe et al. 2020 for methodology and sources. (<https://link.springer.com/article/10.1007/s00267-020-01293-6>)

61 See Figure 2 in Hjerpe et al. 2020 for Western county comparisons of amenity migration rates. (<https://link.springer.com/article/10.1007/s00267-020-01293-6>).

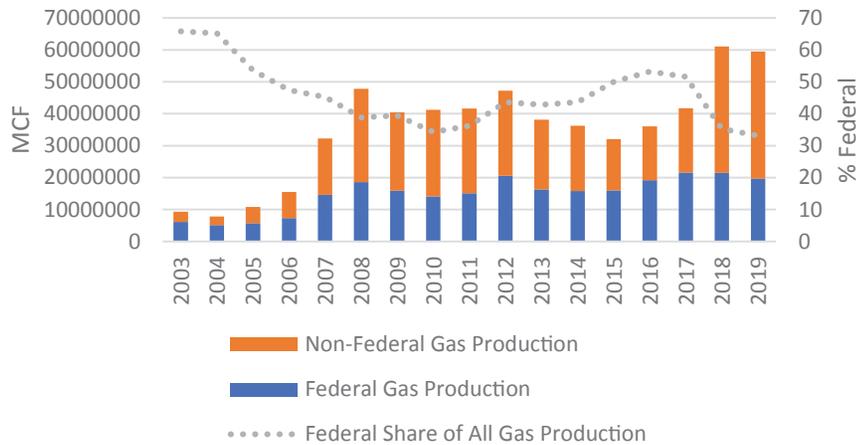
62 Colorado tourism sets all-time visitor spending record in 2018 (<https://www.kjct8.com/content/news/Colorado-tourism-sets-all-time-visitor-spending-record-in-2018-533087741.html>).

63 Mesa County 2019. Abstract of assessment and levies. Ken Brownlee, Mesa County Assessor. (<https://assessor.mesacounty.us/globalassets/assessor/reports/summary-of-levies/2019.pdf>).

64 Headwaters Economic Profile System using DOI and U.S.D.A sources.

65 Mesa County to receive \$3.7 million PILT payment. (<https://thebusiness-times.com/mesa-county-to-receive-3-7-million-pilt-payment/>).

Figure CS2: Federal and Total Gas Production in Mesa County 2003-2019



Data from Colorado Oil and Gas Conservation Commission (COGCC) and Office of Natural Resource Revenue (ONRR).

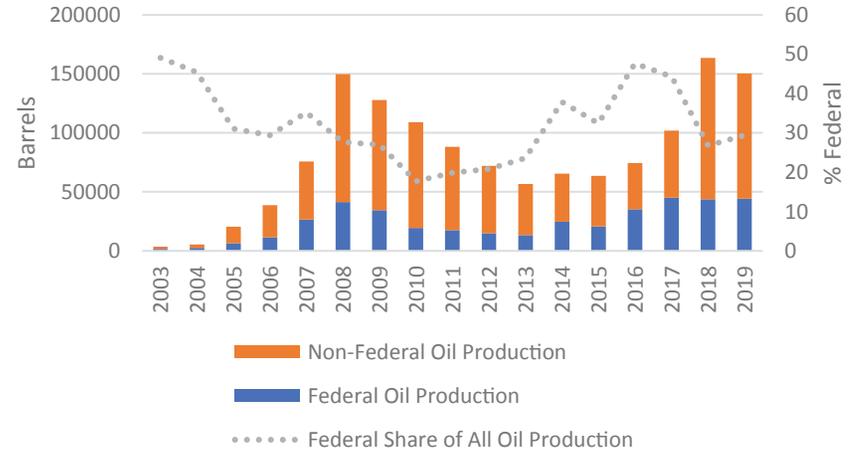
Severance tax revenue for Mesa County was estimated at \$895,000 annually over the last 10 years.<sup>66</sup> And while estimates of ad valorem taxes on oil and gas production in Mesa County are not readily available, oil and gas only represented 8.5% of taxable assessed value in 2019 for Mesa County.<sup>67</sup> Additionally, oil and gas production in Mesa County generated \$8.2 million in federal royalties in 2019, but only \$4.4 million in federal royalties during 2020.<sup>68</sup> Approximately half of federal royalties are distributed back to the states of origin, and then a portion of funds are sent back to the counties. As is common for the Piceance Basin, gas was the primary commodity, making up 85% of total federal revenues.

<sup>66</sup> Effective tax rates on oil and natural gas. 2020. Colorado Legislative Council Staff Memo r20-141.

<sup>67</sup> Mesa County 2019. Abstract of assessment and levies. Ken Brownlee, Mesa County Assessor. (<https://assessor.mesacounty.us/globalassets/assessor/reports/summary-of-levies/2019.pdf>).

<sup>68</sup> U.S.DOI Natural Resources Revenue Data

Figure CS3: Federal and Total Oil Production in Mesa County 2003-2019



Data from Colorado Oil and Gas Conservation Commission (COGCC) and Office of Natural Resource Revenue (ONRR).

### Mesa County Outlook Under a Transition Away from Federal Oil and Gas Development

Oil and gas production on federal lands, has played a contributing role in Mesa County's economic development in the 21<sup>st</sup> century, especially as unconventional drilling helped ramp up production in the late 2000s. Fortunately, Mesa County has other rural economic development options and is not highly dependent on oil and gas production. While ad valorem and severance taxes would be missed from federal oil and gas production, there are ways to make up for these losses including PILT adjustments, rising residential property taxes resulting from amenity development, and stimulus funds.

In terms of Mesa County oil and gas employment, assumptions based on 2019 federal dependence on oil and gas production (30%) indicate that only 1% of the entire regional workforce would be at risk of losing employment

without federal oil and gas production. This would be a minor economic challenge for a county as diverse as Mesa County and could easily be offset by energy transition jobs focused on plugging abandoned wells, capturing methane from existing wells and infrastructure, and renewable energy development.

Furthermore, Mesa County is used to the volatile changes in oil and gas employment. Mesa County gas production and drilling has been recently constricting, even prior to the COVID-19 pandemic. For example, there were only five well starts in Mesa County in 2019, nosediving from the 92 well starts in 2018.<sup>69</sup> In October of 2019, Halliburton, a Texas-based energy service provider laid off 178 workers at its Grand Junction office due to reduced customer activity, saying it was a permanent employment loss.<sup>70</sup>

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69 Drilling activity tanks in region: Mesa County well starts at five, down from 92 in 2018.

([https://www.gjsentinel.com/news/western\\_colorado/drilling-activity-tanks-in-region-mesa-county-well-starts-at-five-down-from-92-in/article\\_897b708e-51be-11ea-879d-2fe0e3f4d1ee.html](https://www.gjsentinel.com/news/western_colorado/drilling-activity-tanks-in-region-mesa-county-well-starts-at-five-down-from-92-in/article_897b708e-51be-11ea-879d-2fe0e3f4d1ee.html)).

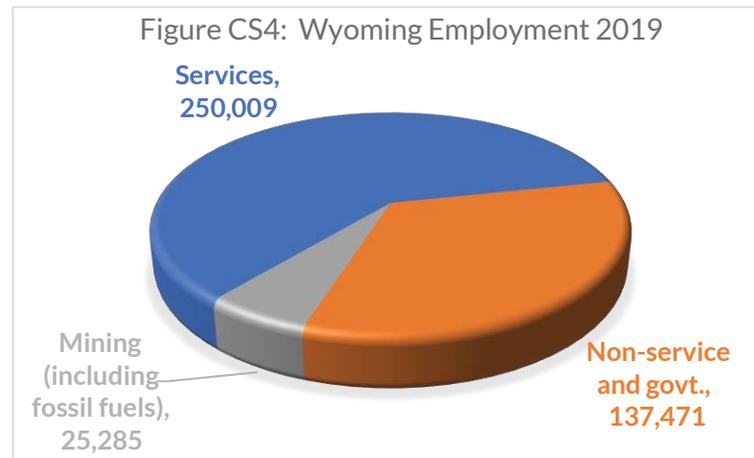
70 Halliburton lays off 178 from Grand Junction office.

([https://www.gjsentinel.com/news/western\\_colorado/find-out-which-oil-company-laid-off-workers-in-it/article\\_a34e7286-ea58-11e9-be50-20677ce06c14.html](https://www.gjsentinel.com/news/western_colorado/find-out-which-oil-company-laid-off-workers-in-it/article_a34e7286-ea58-11e9-be50-20677ce06c14.html)).

# Case Study Exploring a Transition Away from Federal Oil and Gas Development: A Case study of Wyoming

The State of Wyoming represents a unique case of an entire state being heavily dependent on federal oil and gas production and resident counties struggle with attracting migrants. And while there are extensive federal lands in the state that support world-class hunting and fishing and associated guiding and outfitting, outdoor recreation and nature tourism is most prevalent in the Yellowstone and Teton National Parks region in the northwest corner of the state, with some exceptions. Thus, Wyoming will face greater challenges than most in transitioning away from federal oil and gas development, despite decades of future drilling opportunities available on federal lands. A targeted focus on deploying stimulus funds and energy transition jobs in Wyoming will be necessary.

Wyoming is the least populated state in the U.S., with less than 600,000 residents, despite being a large Western state in terms of land area. Figure CS7 shows the employment totals for services, non-service/government, and mining (including fossil fuels) in Wyoming for 2019, which respectively account for 61%, 33%, and 6% of total state employment.



Source: BEA, Regional Economic Accounts

## Importance of Federal Land for Outdoor Recreation and Tourism in Wyoming

About 48% of Wyoming is federal land, with the Bureau of Land Management (BLM) managing 28% of state land and the U.S. Forest Service (USFS) managing 15%. While the federal lands have provided substantial oil and gas production, Wyoming also has a number of protected areas, including preeminent national parks (Yellowstone and Grand Teton), Flaming Gorge National Recreation Area, Devils Tower National Monument, over three million acres of Wilderness, and 3.3 million acres of inventoried Roadless areas.<sup>71</sup> PILT payments to Wyoming counties collectively totaled over \$30 million in 2019, while SRS payments to counties were over \$4 million.

Despite having ample protected areas that draw numerous visitors, and other public lands available for motorized and mechanized recreation, Wyoming has struggled to retain residents and attract migrants. Recent research has shown that Wyoming counties had an average decadal migration rate of -0.5% (out-migration) from 1980-2010, ranking well below other Western states.<sup>72</sup> In terms of the level of amenity development, inclusive of migration rates, housing prices, and seasonal housing, Wyoming counties on average rank in the bottom half of all rural Western counties. This indicates that, in general, Wyoming is not a destination for amenity migrants.

Two findings for amenity migration influences in the rural

<sup>71</sup> Headwaters Economic Profile System for Wyoming and CEI public lands and natural amenities database.

<sup>72</sup> See Figure 2 from Hjerpe et al. 2020 for Western county comparisons of amenity migration rates. (<https://link.springer.com/article/10.1007/s00267-020-01293-6>).

West are important to consider for Wyoming.<sup>73</sup> First, oil and gas dependent counties have an inverse association with migration rates. As oil and gas dependency increases, migration rates decrease. Secondly, warm winters, or the lack thereof, are significant drivers of amenity migration rates. Much of Wyoming experiences very cold winters as compared to most of the rural West, limiting their ability to attract migrants.

### Importance of Federal Land for Oil and Gas Development in Wyoming

Wyoming has the greatest dependence on federal lands for oil and gas production of all Intermountain West states, with federal oil production making up 47% of the state's entire oil production and federal gas production making up 81% of the state's entire gas production in 2019. Federal and state gas production in Wyoming has been steadily decreasing since peaking in 2009. Oil production, on the other hand, has been increasing for the last six years but the biggest gains have been in private and state oil production, as opposed to federal oil production. Tables CS5 and CS6 illustrate the trends in federal and total oil and gas production for Wyoming.

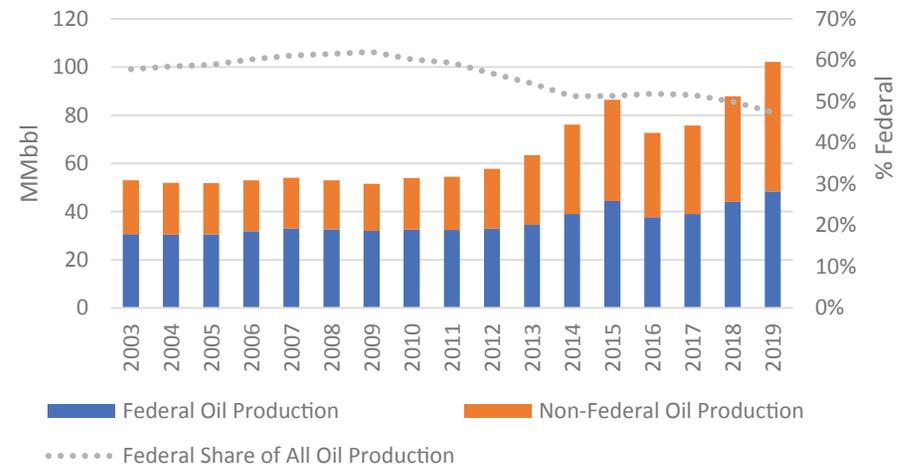
Oil and gas production in Wyoming generated \$834 million in federal royalties and lease revenue bids for oil and gas in 2019, but only \$481 million in federal royalties and lease revenue during 2020.<sup>74</sup> Approximately half of these federal revenues are distributed back to the states of origin. Federal revenue was evenly split between oil and gas, yet coal (not included here) generated slightly more federal revenue than either oil or gas. Overall, federal mineral royalties comprise more than 90% of federal land payments to Wyoming and for the most recent year available (Fiscal Year 2017), federal land payments constituted 13% of Wyoming total general government revenue.<sup>75</sup>

73 Hjerpe, E., Hussain, A., & Holmes, T. (2020). Amenity migration and public lands: Rise of the protected areas. *Environmental management*, 66(1), 56-71.

74 U.S.DOI Natural Resources Revenue Data.

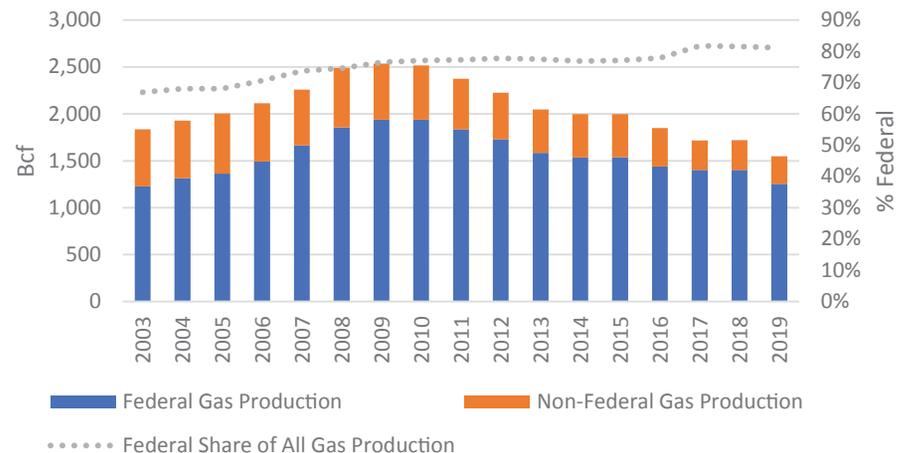
75 Headwaters Economic Profile System—Wyoming federal land payments.

Figure CS5: Federal and Total Oil Production in Wyoming 2003-2019



MMbbl = million barrels. Data Source: U.S. Department of Energy, Energy Information Administration ([https://www.eia.gov/dnav/pet/pet\\_crd\\_crdpn\\_adc\\_mbbbl\\_a.htm](https://www.eia.gov/dnav/pet/pet_crd_crdpn_adc_mbbbl_a.htm)); U.S. Department of the Interior, Office of Natural Resources Revenue (<https://revenue.data.doi.gov/query-data/>); CEI calculations.

Figure CS6: Federal and Total Natural Gas Production in Wyoming 2003-2019



Bcf = billion cubic feet. Data Source: U.S. Department of Energy, Energy Information Administration ([https://www.eia.gov/dnav/ng/ng\\_prod\\_sum\\_a\\_EPG0\\_FGW\\_mmcfa.htm](https://www.eia.gov/dnav/ng/ng_prod_sum_a_EPG0_FGW_mmcfa.htm)); U.S. Department of the Interior, Office of Natural Resources Revenue (<https://revenue.data.doi.gov/query-data/>); CEI calculations

## Wyoming Outlook Under a Transition Away from Federal Oil and Gas Development

Oil and gas production on federal lands, has played a significant role in Wyoming's economic development in the 21<sup>st</sup> century, especially as unconventional drilling ramped up in the late 2000s. Due to cold winter temperatures and a lack of large metropolitan areas,<sup>76</sup> Wyoming has limited amenity development options and is highly dependent on federal oil and gas production. Revenues from federal oil and gas are a major contributor to the state's budget, recently between 10%-20%. A substantial hole in the state budget would be created under a transition away from federal oil and gas development. Regional approaches to modifying PILT payments could be a means to help soften the decrease in mineral royalties. Given our analysis in this report, though, Wyoming has decades of drilling opportunities (estimated at 67 years) on federal lands due to their almost 5 million acres of non-producing leases.

In terms of Wyoming oil and gas employment, assumptions based on 2019 federal dependence on oil and gas production (we assume an average dependency of 65%) indicate that only about 4%, or 16,500 jobs, of the Wyoming workforce would be at risk of losing employment without federal oil and gas production. As this would be one of the higher rates of at-risk employment, transitioning out of federal oil and gas in Wyoming will require extensive federal planning and support for potential lost employment.

Transition jobs with skill requirements that overlap with oil and gas employment, as detailed in our report, will be necessary to fulfill and offset potential job displacement. Given the abundant abandoned and orphaned wells, idled and ageing wells, and vast oil and gas infrastructure in Wyoming, there is a great need for stimulus projects that clean legacy and existing wells and infrastructure. Jobs that plug abandoned wells, detect and repair methane leaks, and site renewable energy projects will be a good fit with Wyoming.

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<sup>76</sup> Hjerpe, E., Hussain, A., & Holmes, T. (2020). Amenity migration and public lands: Rise of the protected areas. *Environmental management*, 66(1), 56-71.

# Appendix A Methods for Estimating Years of Drilling Opportunity and Lease Expiration on Federal Lands

Using the non-producing leases ( $NPL_{2020}$ ) stockpile information and the assumptions detailed in the text enables us to estimate how many leases will be preserved between 2021 and 2030 (by which time all stockpiled leases will expire if they are not drilled):

$$PL_i = \min\left(10 * \frac{1}{2} DI_i, NPL_{2020}\right),$$

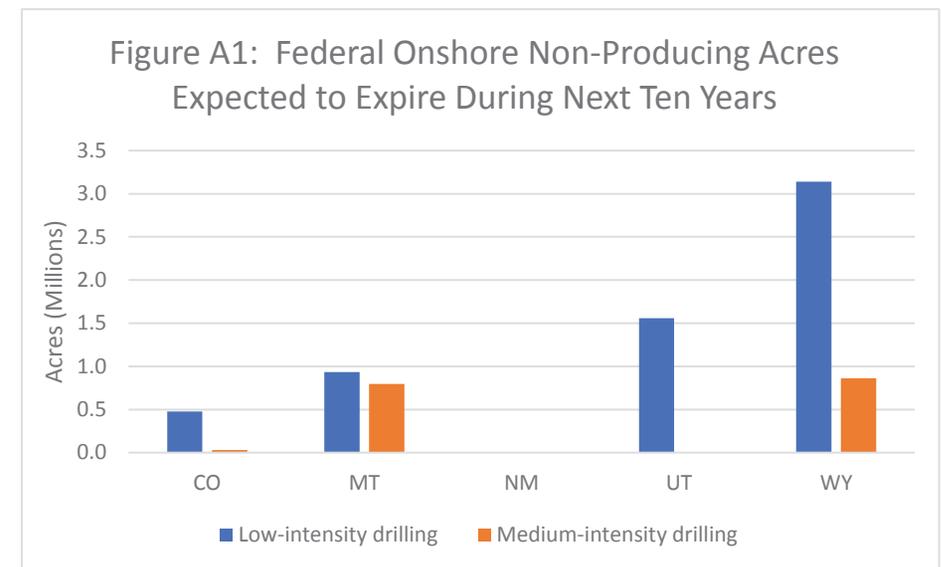
where  $PL_i$  denotes preserved leases under drilling intensity  $i$ ,  $DI_i$ .

Preserved leases are converted to preserved acres by assuming an average lease size of  $NPA_{2020}/NPL_{2020}$ , where  $NPA_{2020}$  denotes the FY 2020 year-end stockpile of federal non-producing acres. This provides an estimate of the area the industry has at its disposal for future drilling. We assume industry will develop the preserved leases to the ten-year (2011-2020) average well density ( $APW$ ) on producing federal leases in the given region (state or nation).<sup>77</sup> Thus, years of drilling opportunities ( $YODO_i$ ) is calculated as:

$$YODO_i = \frac{PL_i * \frac{NPA_{2020}}{NPL_{2020}}}{\frac{1}{2} DI_i * \overline{APW}}$$

The national-level analysis results in lease expiration only under the assumption of low-intensity drilling, which results in more than 6,600 leases and 6.5 million acres expiring. State-level analyses indicate low-intensity drilling would result in more than 6,500 leases and 6.1 million acres expiring in the Intermountain West region. Moderate-intensity drilling would preserve

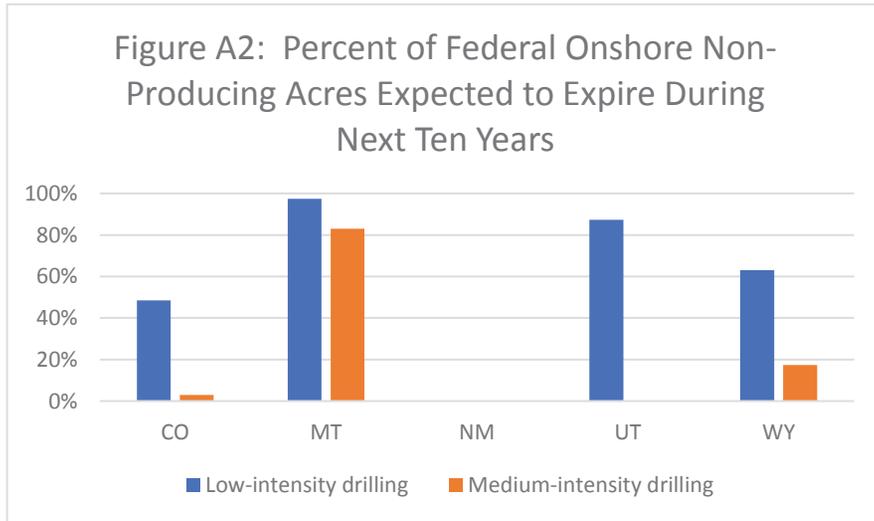
additional leases; fewer than 2,000 leases and 2 million acres would expire in the Intermountain West region. The distribution of expired acreage is depicted in Figure A1. In New Mexico, drilling rates are sufficiently high and stockpiled  $NPL_{2020}$  are sufficiently low that no leases or acreage are expected to expire, even with low intensity drilling. In contrast, there is such a large  $NPL_{2020}$  stockpile in Wyoming (where low-intensity drill rates are like those in New Mexico and moderate-intensity drilling rates are 30% higher) that more than 3 million acres are expected to expire in the next 10 years unless moderate-intensity drilling is used.



Data Source: CEI calculations

<sup>77</sup> BLM data is used to calculate  $APW$  in year  $t$  as producing acres ( $PA$ ) per well completion ( $WC$ ):  $APW_t = \frac{PA_t}{WC_t}$ .

Figure A2 presents expired acres expressed as a percent of  $NPA_{2020}$ . Presented in this manner, the results illustrate the excessive speculative stockpiling undertaken by the industry, particularly in Montana and Utah, at considerable cost to the public.



Data Source: CEI calculations