

## MEMORANDUM

TO: Kathleen Sgamma, VP of Government & Public Affairs, Western Energy Alliance  
FROM: John Dunham, Managing Partner  
DATE: May 14, 2015  
RE: Final Analysis of the Impact of Greater Sage Grouse Restrictions on Oil and Natural Gas Development and Production

---

### Executive Summary:

The Greater Sage-Grouse (GrSG) is a large ground-dwelling bird that inhabits 186 million acres in eleven western states. The species is currently being considered for listing under the Endangered Species Act (ESA). States are also implementing plans to conserve the species, and federal land managers are implementing restrictions to development on public lands throughout the species' range. Since several major oil and natural gas basins overlap GrSG habitat areas, these restrictions will impact job creation and economic growth across the region. This analysis provides an estimate of the cost of those restrictions on western economies due to diminished oil and natural gas development and production.

The oil and natural gas exploration and production industry currently generates more than 173,860 jobs in the 13 western states.<sup>1</sup> Approximately 62 percent (107,700) of these jobs are in four states – Colorado, Montana, Utah, and Wyoming – which are home to GrSG.

Many of these jobs, along with the potential development of new oil and natural gas wells, could be put in jeopardy if onerous restrictions are enacted as part of efforts to protect the GrSG and its habitat. There are a number of alternative protection regimes currently being discussed related to preserving GrSG habitat at both the state and federal level. These range from the development of more restrictive land use plans in states to a listing under the ESA. For the purpose of this analysis, four potential regulatory scenarios were examined. They are:

- Enhanced State Restrictions on State and Fee Priority Areas<sup>2</sup> (Scenario One);
- Enhanced Federal Restrictions on State, Fee and Federal Priority Areas (Scenario Two);
- A U.S. Fish and Wildlife Service (FWS) Determination of Threatened Status with Enhanced Federal Restrictions of State and Fee Priority Areas and No Activity on Federal Priority Areas for four years after which Enhanced Federal Restrictions Apply (Scenario Three);

---

<sup>1</sup> Based on John Dunham and Associates, *Western Oil & Natural Gas Employs America*, prepared for Western Energy Alliance, 2014, at: [www.westernenergyalliance.org/employsamerica](http://www.westernenergyalliance.org/employsamerica). Nationwide, oil and natural gas exploration and production in these 13 states create a total of over 268,100 jobs.

<sup>2</sup> For the purpose of this analysis, Priority Areas are defined as Effective conservation strategies and are predicated on identifying key areas across the landscape that the FWS believes are necessary to maintain redundant, representative, and resilient populations. According to the agency, most of the individual states within the range of sage-grouse have identified and mapped key habitats necessary for sage-grouse conservation in the development of their state management plans for this species. FWS used these existing maps to identify the most important areas needed for maintaining sage-grouse representation, redundancy, and resilience across the landscape. These areas were named Priority Areas for Conservation (PACs) See: *Greater Sage-grouse (Centrocercus urophasianus) Conservation Objectives: Final Report*, U.S. Fish and Wildlife Service, Denver, CO. February 2013. On-line at: [www.fws.gov/mountain-prairie/species/birds/sagegrouse/COT/COT-Report-with-Dear-Interested-Reader-Letter.pdf](http://www.fws.gov/mountain-prairie/species/birds/sagegrouse/COT/COT-Report-with-Dear-Interested-Reader-Letter.pdf)

- A FWS Determination of Endangered Status with no Activity in any Priority Area for four years after which Enhanced Federal Restrictions Apply (Scenario Four).

Each of these management options present a range of operational restrictions that companies producing oil and natural gas in the four states being studied would have to address as part of the development process. These restrictions would increase the cost of developing oil and natural gas resources, and because of the higher costs, would likely reduce overall production as more marginal opportunities would no longer be pursued. These four scenarios represent a laddering of more burdensome restrictions, with each scenario applied to a greater portion of the physical land area, leading to higher costs.

Looking at a range of potential management options, John Dunham & Associates (JDA) finds that restrictions will result in a range of job losses from 9,170 to over 18,250 and reduced economic growth of between \$2.435 billion and \$4.847 billion depending on how the final regulations read. These are annualized figures. Table 1 below outlines these economic impacts for each of the four Scenario Assumptions.

**Table 1**  
**Estimated Annual Economic Impact of GrSG Restrictions Upon Full Implementation**

(\$ Millions)	Job Impact	Wage Impact	Output Impact	Tax Impact
<b>Scenario 1</b>				
Colorado	(4,088)	(\$359.69)	(\$1,202.26)	(\$111.32)
Montana	(900)	(\$63.58)	(\$225.75)	(\$20.83)
Utah	(646)	(\$40.98)	(\$134.95)	(\$13.29)
Wyoming	(1,027)	(\$90.79)	(\$387.53)	(\$38.73)
United States	(9,172)	(\$697.05)	(\$2,435.13)	(\$347.68)
<b>Scenario 2</b>				
Colorado	(4,111)	(\$361.68)	(\$1,208.90)	(\$111.94)
Montana	(907)	(\$64.08)	(\$227.53)	(\$20.99)
Utah	(670)	(\$42.50)	(\$139.96)	(\$13.78)
Wyoming	(1,040)	(\$91.97)	(\$392.55)	(\$39.24)
United States	(9,267)	(\$704.22)	(\$2,460.18)	(\$351.14)
<b>Scenario 3</b>				
Colorado	(7,432)	(\$653.88)	(\$2,185.56)	(\$202.37)
Montana	(1,242)	(\$87.74)	(\$311.53)	(\$28.74)
Utah	(1,700)	(\$107.89)	(\$355.25)	(\$34.99)
Wyoming	(2,065)	(\$182.54)	(\$779.15)	(\$77.88)
United States	(16,810)	(\$1,277.43)	(\$4,462.71)	(\$643.63)
<b>Scenario 4</b>				
Colorado	(8,077)	(\$710.60)	(\$2,375.13)	(\$219.93)
Montana	(1,295)	(\$91.47)	(\$324.76)	(\$29.96)
Utah	(1,953)	(\$123.96)	(\$408.18)	(\$40.20)
Wyoming	(2,244)	(\$198.38)	(\$846.74)	(\$84.63)
United States	(18,259)	(\$1,387.57)	(\$4,847.48)	(\$700.21)

## Analysis

Based on a recent analysis conducted for the Western Energy Alliance, the oil and natural gas exploration and production industry currently generates more than 173,860 jobs in the 13 western states.<sup>3</sup> Approximately 62 percent (107,700) of these jobs are in four states – Colorado, Montana, Utah, and Wyoming – which are primarily home to GrSG. (Table 2)

**Table 2**  
**Jobs Related to Oil and Natural Gas Development in Western States**

State	Jobs	Percent
Colorado	60,135	34.6%
Montana	7,663	4.4%
Utah	15,077	8.7%
Wyoming	24,813	14.3%
Subtotal	107,688	61.9%
Western US Total	173,860	100.0%

These jobs could be impacted by the regulations currently being considered to protect the GrSG across its habitat. These regulations have not been fully promulgated as of yet, but have been outlined in a number of different GrSG management plans offered by both the impacted states and the Federal Government. The potential restrictions are:

- 1) Enhanced State Restrictions on State and Fee Priority Areas;
- 2) Enhanced Federal Restrictions on State, Fee and Federal Priority Areas;
- 3) A FWS Determination of Threatened Status with Enhanced Federal Restrictions of State and Fee Priority Areas and No Activity on Federal Priority Areas for four years after which Enhanced Federal Restrictions Apply;
- 4) A FWS Determination of Endangered Status with no Activity in any Priority Area for four years after which Enhanced Federal Restrictions Apply.

These potential restrictions would increase the cost of developing oil and natural gas resources, and because of the higher costs, would likely reduce overall production as more marginal opportunities would no longer be pursued. These four scenarios represent a laddering of more burdensome restrictions, with each scenario applied to a greater portion of the physical land area, or leading to higher costs.

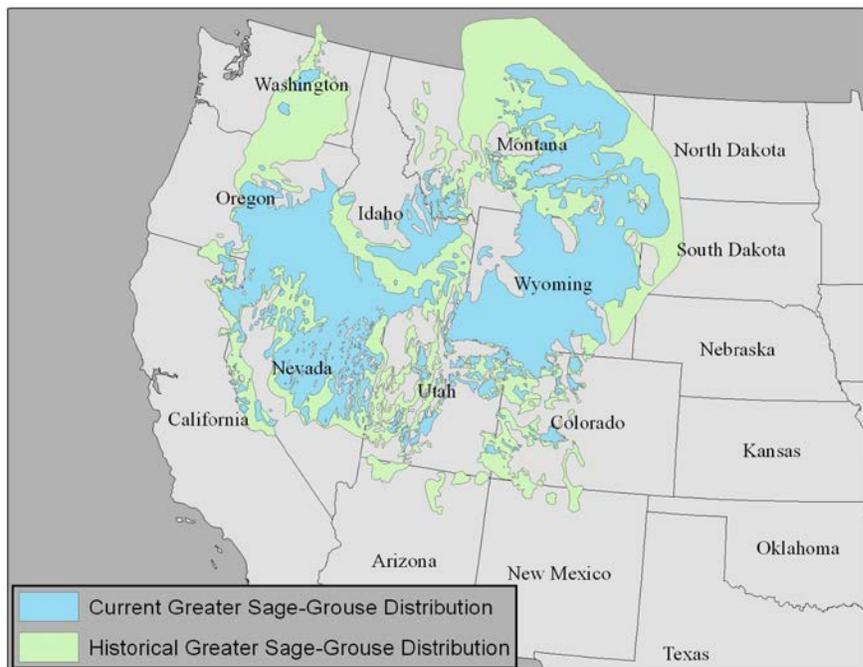
## Background:

The GrSG is a large ground-dwelling bird that inhabits 186 million acres in eleven western states. Due to a settlement agreement with environmental groups, the FWS has until September 2015 to determine whether it will list the species under the ESA.<sup>4</sup>

<sup>3</sup> Based on John Dunham and Associates, *Western Oil & Natural Gas Employs America*, prepared for Western Energy Alliance, 2014, at: [www.westernenergyalliance.org/employsamerica](http://www.westernenergyalliance.org/employsamerica)

<sup>4</sup> Note that recent legislation precludes a listing at least through October of 2015.

**Figure 1**  
**Map of GrSG Habitat**



The FWS does not have accurate figures on the number of birds in the United States; however, a recent report suggests that there may be as many as 500,000 across its range, with the largest concentration being in Wyoming.<sup>5</sup> Never before has such a wide-ranging and numerous species been seriously considered for listing under the ESA.

FWS has suggested that declining populations of GrSG in recent years is, to a large extent, due to habitat loss and fragmentation. This claim is of particular importance to western states with significant oil and natural gas production, since much of the bird's range in the western states coincides with large oil and natural gas basins including the Green River, Niobrara, Powder River, Wind River, Uinta/Piceance, and Williston.

In addition, much of the oil and natural gas development in the west – particularly in Wyoming, but also in Colorado, Utah and Montana – occurs on public lands managed by the Bureau of Land Management (BLM) or the U.S. Forest Service (USFS), or on Native American lands regulated by the Bureau of Indian Affairs (BIA). Therefore, any additional federal restrictions on drilling and production could disproportionately impact development in these states.

In the spring, GrSG males and females congregate to breed on large, open flats surrounded by sagebrush. The areas where they congregate for courtship displays, called *leks*, and where they nest and raise their young are of particular interest. Within these areas, governments at both the state and federal level already restrict a range of economic activities

<sup>5</sup> *Proposed Rules*, U.S. Fish & Wildlife Service, 50 CFR Part 17. Available on-line at: [www.fws.gov/wyominges/PDFs/Findings/SageGrouse/FR03052010.pdf](http://www.fws.gov/wyominges/PDFs/Findings/SageGrouse/FR03052010.pdf)

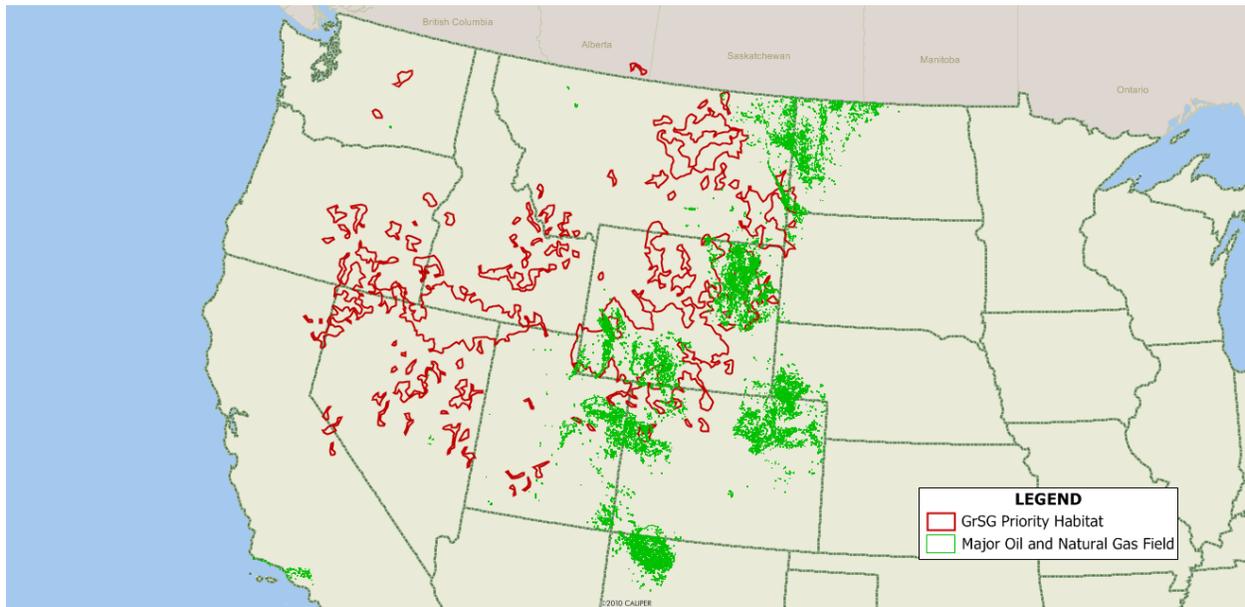
**Table 3**  
**Size of Priority GrSG Areas**

State	Total State Size (acres)	Priority Area (acres)	Percent
Colorado	66,379,520	2,050,256	3.1%
Montana	93,153,280	2,951,508	3.2%
Utah	52,572,160	2,208,651	4.2%
Wyoming	62,144,000	20,037,187	32.2%

Each of the states where GrSG are found, have adopted conservation plans which identify areas of crucial (or “priority”) habitat. These areas represent substantial parts of the four states examined. In fact, these areas constitute approximately 32 percent of the total land area in Wyoming and over 3 percent of the state of Colorado.

Figure 2 below shows the priority GrSG areas across the western portion of the United States.<sup>6</sup> As the map shows, these priority habitat areas overlap many of the same parts of the country where significant oil and natural gas development is taking place. This is particularly true in the states of Wyoming and Montana.

**Figure 2**  
**GrSG Priority Areas in Four States Modeled in the Analysis**



Much of this land, however, is not located in areas where oil and natural gas is found or where it can be economically accessed. According to data from the US Department of Energy, over 55

<sup>6</sup> The BLM and USFS have identified certain Sagebrush Focal Areas, which are important blocks with high breeding population densities of sage-grouse, existing high quality sagebrush habitat, and a preponderance of federal ownership or protected area that serves to anchor the conservation value of the landscape. Priority Habitat Management Areas (or Priority Habitat), includes focal areas and other blocks managed to avoid and minimize further disturbance. General Habitat Management Areas are more extensive and offer greater flexibility for land use activities

percent of the land area of Colorado and Wyoming has a potential for development, while only 39 percent of Utah's acreage and about 31 percent of the land area of Montana have similar potential.<sup>7</sup> Table 4 shows these percentages.

**Table 4**  
**Acreage in Active and Potential Petroleum Basins**

State	Total State Size (acres)	Area in Current and Potential Oil and Natural	
		Gas Basins	Percent
Colorado	66,379,520	37,814,524	57.0%
Montana	93,153,280	35,906,373	38.5%
Utah	52,572,160	16,509,442	31.4%
Wyoming	62,144,000	36,056,952	58.0%

As Figure 2 shows, priority habitat areas overlap existing oil and gas basins, so depending on how potential restrictions are applied, a significant part of the developable areas could face substantial cost increases and reduced production. It is estimated that anywhere between nine and 79 percent of producing areas across the four states being examined in this analysis could face significantly greater restrictions. (See Table 5)

In addition to restricting access for potential oil and natural gas exploration and development in the priority areas, many of the conservation measures being examined would restrict activity during certain times of the year in both leks and in other habitat areas including nesting and wintering areas. Geographic data on all of these areas are not available, however, some information as to the locations of leks within the states of Colorado, Utah and Wyoming has been compiled.<sup>8</sup> Combined with restriction on priority habitat, restrictions on drilling, exploration or other activities in zones equivalent to a four-mile circle around each lek could lead to substantial restrictions on even a larger portion of the geography of the four states analyzed. (See Figure 3)

**Table 5**  
**Estimate of Impacted Oil and Natural Gas Field Areas**

State	Acreage in Active and	Acreage in	Percent of Active and	Acreage in General	Combined Percent of		Acreage in Non-
	Potential Basins	Priority Habitat	Potential Basins	Habitat	Active and Potential	Basins	Habitat
Colorado	37,814,524	2,050,256	5.4%	1,246,995	8.7%		34,517,273
Montana	35,906,373	2,951,508	8.2%	9,400,134	34.4%		23,554,731
Utah	16,509,442	2,208,651	13.4%	1,103,228	20.1%		13,108,563
Wyoming	36,056,952	20,037,187	55.6%	8,342,209	78.7%		7,677,556

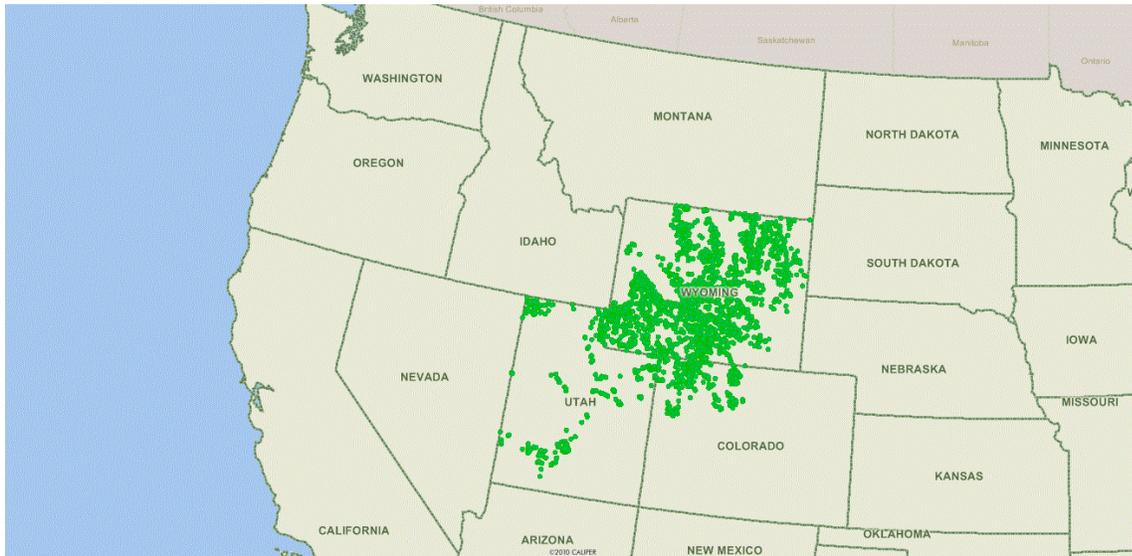
As Figure 3 shows, just as with the priority habitat, much of the state of Wyoming would fall within four miles of an existing lek. The same is true of the Piceance Basin in Colorado and the Unita Basin in Utah. Data on lek locations is not available for the state of Montana, but based on

<sup>7</sup> See *Lower 48 States Shale Plays*, US Department of Energy, Energy Information Administration, at [http://www.eia.gov/oil\\_gas/rpd/shale\\_gas.pdf](http://www.eia.gov/oil_gas/rpd/shale_gas.pdf)

<sup>8</sup> Geospatial data on the location of existing leks was provided to John Dunham and Associates by the Western Energy Alliance and its member companies. Data received January 9, 2015.

the data from the other states, it would appear that about 20 percent of existing oil and natural gas development is currently occurring in areas within the four-mile boundaries of existing lek locations. Table 6 shows the percentage of existing wells located within both one kilometer and four miles of leks.

**Figure 3**  
**Priority Habitat within Four Miles of an Existing Lek**



Note: Data on Montana are not available

As the data suggest, a substantial part of the petroleum rich areas of the four states being examined could be impacted by new regulations related to the GrSG. While there is not a one-to-one correlation between the area falling under specific restrictions and actual oil and natural gas exploration and development activities, the larger the impacted area, the greater the impact not only on development and production, but also on jobs and economic activity in the states.

**Table 6**  
**Estimate of Impacted Oil and Natural Gas Wells Within Lek Zones**

State	Leks	Wells	Existing Wells Within 1 Kilometer Band	Percent of Total	Existing Wells Within 4 Mile Band	Percent of Total
Colorado	239	63,026	138	0.22%	2,417	3.83%
Montana	192	14,290	109	0.76%	2,917	20.41%
Utah	317	17,864	39	0.22%	778	4.36%
Wyoming	1,890	100,806	1,858	1.84%	53,477	53.05%

The next section of this report outlines the existing and potential regulations related to oil and natural gas development and the four scenarios to be examined in the analysis.

## State Management Plans

In order to ensure that GrSG habitat is protected without resorting to one-size-fits-all federal regulations, impacted states have been working to update their management plans, most of which already require drilling operations to be suspended during certain times of the year and require that drilling not occur within a specified distance of leks and other sensitive areas. Similar regulations apply to other operations including wind farms, ranching, logging, mining, and other economic activities.

Based on an extensive review of these plans by both JDA staff and industry officials, the potential restrictions in the states in question would be similar to those currently in place; however, the periods of time when drilling or other activities could take place, and buffers around leks and other GrSG habitat areas would in many cases increase. In addition, there are substantial new limits on the amount of land area where human-related activities are allowed. These new regulations could also significantly increase the cost of developing and maintaining oil and natural gas wells not only in habitat areas, but throughout the western United States.

While restrictions vary somewhat depending on the specific area and activity, in general a wide-range of activities are currently prohibited between a quarter mile and a kilometer of leks and certain habitat areas during specific periods of the year. More recent plans, like those from Montana, Utah, and Wyoming, would also put permanent caps on the amount of surface disturbing activities in certain areas.

Table 7 outlines the expected state level restrictions on development in GrSG priority areas.

**Table 7**  
**State Specific Restrictions<sup>9</sup>**

State	Distance Restrictions	Time Restrictions	Disturbance Restrictions
Colorado	0.6 Miles from Lek: Generally no Activity Allowed 4.0 Miles from Lek: Restrictions	March Through June	5% Disturbance Limit
Montana	1 Mile from Lek: No Activity Allowed 2 Miles from Lek: Significant Restrictions	December 1 Through June 15	5% Disturbance Limit
Utah	1 Mile from Lek: No Permanent Disturbance 4 Miles from Lek: Significant Restrictions	November 15 Through July 15	5% Disturbance Limit
Wyoming	0.6 miles from Lek: No Activity Allowed Over 0.6 miles from Lek: Restrictions	December 15 Through June 30	5% Disturbance Limit

<sup>9</sup> The restrictions related to sage grouse habitat are extremely complex and different restrictions apply to different industries. In some cases restrictions that apply to another industry – for example cattle grazing – may impact upon the petroleum sector. The restrictions listed in this table are simplified rules developed by John Dunham and Associates and based on the most recent Conservation Plan for Greater Sage-grouse in the various states. **Colorado:** *Colorado Greater Sage-grouse Steering Committee, Colorado greater sage-grouse conservation plan, Appendix B: GrSG Disturbance Guidelines*, Colorado Division of Wildlife, 2008, available on-line at <http://cospl.coalition.org/fedora/repository/co:7186/nr62sa1200818internet.pdf>; **Montana:** *Executive Order Creating the Montana Sage Grouse Habitat Conservation Program*, State of Montana, Office of the Governor, Executive Order 10-2014, available on-line at <http://fwp.mt.gov/fishAndWildlife/management/sageGrouse/habitatConservation/>; **Utah:** *Conservation Plan for Greater Sage-grouse in Utah*, Utah Division of Wildlife Resources, February 14, 2013, available on line at: [https://wildlife.utah.gov/uplandgame/sage-grouse/pdf/greater\\_sage\\_grouse\\_plan.pdf](https://wildlife.utah.gov/uplandgame/sage-grouse/pdf/greater_sage_grouse_plan.pdf); **Wyoming:** *Greater Sage-Grouse Core Area Protection, Executive Order 2011-5*, State Of Wyoming, Executive Department, 2011, available on-line at [http://wgfd.wyo.gov/web2011/Departments/Wildlife/pdfs/SAGEGROUSE\\_EO\\_COREPROTECTION0000651.pdf](http://wgfd.wyo.gov/web2011/Departments/Wildlife/pdfs/SAGEGROUSE_EO_COREPROTECTION0000651.pdf)

## Federal Management Plans

The BLM and USFS are currently updating 98 public land management plans with new restrictions for GrSG, including restrictions on the development of oil and natural gas resources and maintenance of facilities. Based on an extensive review of these plans by both JDA staff and industry officials, the potential restrictions in the states in question would be similar to those being developed at the state level; however, the restricted dates and distance controls from leks and habitats would in some cases be more restrictive. Table 8 outlines the basic federal level restrictions for each state.

Generally speaking, these restrictions increase costs due to timing limitations on activities. Specifically, they increase demand for resources during available drilling periods, and ensure that most drilling occurs during fall and winter months when costs might be higher. In addition, GrSG conservation plans increase the costs of planning and structuring of activities in order to minimize the effects of noise or infrastructure development on larger nesting areas. Overall, these restrictions will reduce new oil and natural gas developments because they will take large areas of potential reserves out of production, or make them extremely difficult and expensive to exploit.

**Table 8**  
**Potential Federal Level Restrictions<sup>10</sup>**

State	Distance Restrictions	Time Restrictions	Disturbance Restrictions
Colorado	0.6 Miles from Lek: Generally no Activity Allowed		
	4.0 Miles from Lek: Restrictions	April Through June	5% Disturbance Limit
Montana	0.6 miles from Lek: No Activity Allowed		
	2.0 Miles from Lek: Significant Restrictions	March 1 Through July 15	3% Disturbance Limit
Utah	Disturbance		
	4 Miles from Lek: Restrictions	February 15 Through August 15	5% Disturbance Limit
Wyoming	0.6 miles from Lek: No Activity Allowed		
	2.0 miles from Occupied Leks	March 15 Through June 30	5% Disturbance Limit

## ESA Listing Scenarios

Were GrSG to be listed as *threatened*, it would mean that the FWS had determined that it is likely to become endangered in the foreseeable future throughout all or a significant portion of

<sup>10</sup> Note that the restrictions are extremely complex and different restrictions apply to different types of habitats and during different seasons. The most restrictive criteria are included in this table. Based on: **Colorado:** *Northwest Colorado Greater Sage Grouse Draft Land Use Plan Amendment and Environmental Impact Statement*, US Department of the Interior, Bureau of Land Management and US Department of Agriculture, Forest Service, August 2013, on-line at: [www.blm.gov/epl-front-office/projects/lup/36511/44083/47470/default.jsp?projectName=Northwest+Colorado+Greater+Sage-Grouse+Draft+RMP+and+EIS](http://www.blm.gov/epl-front-office/projects/lup/36511/44083/47470/default.jsp?projectName=Northwest+Colorado+Greater+Sage-Grouse+Draft+RMP+and+EIS); **Montana:** *Miles City Field Office Resource Management Plan and Environmental Impact Statement*, **Utah:** *Utah Greater Sage-Grouse Draft Land Use Plan Amendment and Environmental Impact Statement*, US Department of Interior, Bureau of Land Management and US Department of Agriculture, Forest Service, October 2013, at: [http://www.blm.gov/ut/st/en/prog/planning/SG\\_RMP\\_rev/deis.html](http://www.blm.gov/ut/st/en/prog/planning/SG_RMP_rev/deis.html); **Wyoming:** *The Wyoming Greater Sage-Grouse Draft Land Use Plan Amendment and Draft Environmental Impact Statement*, US Department of Interior, Bureau of Land Management, December 2013, on-line at: <https://www.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=18704>

its range. On the other hand, an *endangered* listing means that the FWS has determined that the GrSG is in danger of extinction throughout all or a significant portion of its range in the near future.

Were either listing to be in effect, the restrictions on development activities on both federal and fee lands could be very significant. Generally, the restrictions being proposed are intensified versions of the current state standards, but have little flexibility built in, and therefore create additional federal bureaucracy and burdens. Were these restrictions to apply only to federal lands and lands with federal minerals, the overall effects would be muted by the fact that only about 3,600 applications for permits to drill (APDs) are issued on average each year in the four states studied combined, this makes the overall pool of potential new activity quite small.<sup>11</sup> On the other hand, were the restrictions to apply to state controlled and fee lands, they could be much more costly. Both of these two scenarios are developed as part of this analysis.

Both of these listing scenarios would place severe restrictions on the development of oil and natural gas resources in much of the federally controlled land across the range of the species, and would impact the development of resources on state and fee lands. Were the species to be listed as threatened, it is unlikely that any federal leases or APDs would be issued in much of the priority habitat for a number of years during which time the agency and industry would need to come up with specific mitigation measures. Drilling would still be allowed in priority state and fee lands under restrictions in certain circumstances. Were the unlikely event to occur and the species be listed as endangered, then it is likely that no oil or natural gas development could occur in any of the areas shown in Figure 4 on page 14, until such time as stringent mitigation and reclamation measures are developed.<sup>12</sup>

### **Potential Restrictions:**

There are currently two parallel regulatory processes taking place pertaining to the GrSG. Due to a settlement agreement with environmental groups, the FWS has been evaluating whether to list the species under the ESA.<sup>13</sup> At the same time, governments of impacted states have been working with both the Federal government and with interested parties to develop their own species management criteria and restrictions that are already in effect or will go in to effect whether or not the FWS decides to list the species under the ESA.

This analysis examines four separate scenarios related to protections that could be placed on oil and natural gas development due to the GrSG that together reflect both of these regulatory tracks. These scenarios are:

---

<sup>11</sup> Based on data for the past 10 years. About 70 percent of all APD's issued by the Bureau of Land Management have been in these four states. In FY 2013, the last year for which data are available, only 2,300 were issued. See: *Number of Drilling Permits Approved by Fiscal Year on Federal Lands*, US Department of the Interior, Bureau of Land Management, November 18, 2013 at: [www.blm.gov/wo/st/en/prog/energy/oil\\_and\\_gas/statistics.html](http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/statistics.html)

<sup>12</sup> For the purposes of this analysis it is assumed that a listing would lead to a moratorium on activity for about 4 years, after which it is likely that a 4(D) rule would be put in place. Section 4(d) of the ESA allows the FWS to establish special regulations that take the place of the normal protections of the ESA and may either increase or decrease the ESA's normal protections. The ESA specifies that 4(d) rules must be "necessary and advisable to provide for the conservation of such species." One use of 4(d) rules is to relax the normal ESA restrictions to reduce conflicts between people and the protections provided to the threatened species by the ESA. A 4(d) rule can be used in such a situation if those conflicts would adversely affect recovery and if the reduced protection would not slow the species' recovery.

<sup>13</sup> Note that recent legislation precludes a listing at least through October of 2015.

- 1) Enhanced State Restrictions on State and Fee Priority Areas;
- 2) Enhanced Federal Restrictions on State, Fee and Federal Priority Areas;
- 3) FWS Determination of Threatened Status with Enhanced Federal Restrictions of State and Fee Priority Areas and No Activity on Federal Priority Areas for four years after which Enhanced Federal Restrictions Apply;
- 4) FWS Determination of Endangered Status with no Activity in any Priority Area for four years after which Enhanced Federal Restrictions Apply.

The scenarios are designed to build on one another such that Scenario 2 increases the restrictions built up in Scenario 1, and so forth and so on.<sup>14</sup>

Increased restrictions on drilling in areas where GrSG might mate or nest will increase overall project development costs, which would have a detrimental impact on the number of wells drilled or maintained. These costs will likely come from four different sources: reduced operational time, increased permitting costs, increased reclamation costs, and reduced exploitable area. In addition, the timing restrictions and restrictions on the amount of disturbance allowed in certain areas surrounding GrSG leks and nesting sites will increase operational costs; however, it is difficult to determine these costs in an aggregate manner as they would be highly dependent on the geographical nature of specific leaseholds and fields. Table 9 outlines the increased costs estimated for each scenario.

As costs rise, leaseholders and companies involved in the development of oil and natural gas resources would either be precluded from operating in specific areas, or would face higher costs. This would reduce the potential for development -particularly in Colorado, but also Montana, Utah and Wyoming. As Table 9 shows, under and Endangered Species Designation, almost all of the developable land area in Wyoming would be subject to substantial restrictions.

**Table 9**  
**Cost Assumptions for Each Modeling Scenario**

Parameter	Scenario 1	Scenario 2	Scenario 3	Scenario 4
<b>Increases in Permitting Costs</b>				
Administrative and Consulting Costs	\$1,600	\$1,600	\$20,000	\$20,000
Cost of Increased Delay Time	\$0	\$0	\$7,897	\$15,635
<b>Increase in Reclamation Costs</b>				
Additional Cost per Well	\$10,000	\$10,000	\$10,000	\$10,000
<b>Reduction in Available Developable Land</b>				
	<b>Scenario 1</b>	<b>Scenario 2</b>	<b>Scenario 3</b>	<b>Scenario 4</b>
Colorado	-5.42%	-6.12%	-8.72%	-9.42%
Montana	-8.22%	-10.65%	-34.40%	-36.83%
Utah	-13.38%	-19.16%	-20.06%	-25.84%
Wyoming	-55.57%	-78.71%	-78.71%	-87.57%
<b>Increased Drilling and Completion Costs from Timing Restrictions</b>				
Oil Wells	1.55%	2.48%	2.48%	2.48%
Gas Wells	1.51%	2.42%	2.42%	2.42%

<sup>14</sup> The effects of existing restrictions on non-priority general habitat areas are not modeled in this analysis.

### Higher Drilling and Service Costs Due to a Shorter Activity Window:

The drilling window issue is of particular importance to the industry. A shorter activity window would raise the overall costs to develop a well in three ways:

- There are a limited number of crews and a limited amount of equipment (particularly rigs), so competition for these resources in a smaller time window will drive up prices. For example, if there are five projects competing for a drilling rig and drilling can occur over a 10 month period, the equipment is available for two months per project, providing more than adequate coverage and time to move from project to project. If the drilling window were cut in half, the rig would only be available for one month per project, greatly limiting the available rig time and leading to the cancellation of more marginal projects. Were the window to be cut to just three months, it is likely that only one or two projects might even be developed.
- In addition to facing higher costs for crews and rigs, operators would be forced to move equipment more often as drilling windows shift. For example, rather than drilling 10 wells from a well pad over the course of a three-month period, an operator would have to drill three wells in a month, move the rig to another location, then come back to the old location the following year to continue developing that particular resource play. This could also increase reclamation costs over time, as these activities would need to be repeated over and over again.
- Finally, if maintenance operations are restricted to tight windows, the industry will have a difficult time servicing currently-operating wells. This would lead to a reduction in well output and a direct cost to the industry.

Based on the model outlined below, it is estimated that changes in drilling and operational windows alone will increase drilling costs for oil wells by between 1.6 and 2.5 percent across the four states examined, and increase costs for gas wells by between 1.5 and 2.4 percent.

It is assumed that these costs will apply across all four of the scenarios; however, in the first scenario they would only apply to projects on state and fee leases, while in the remainder they would impact all projects in priority GrSG areas. In the scenarios involving listing, it is assumed that no drilling would occur on federal lands for about four years while new mitigation rules are being developed.

### Higher Development Costs Due to Reduced Drilling Area:

In addition to the costs brought on by shorter drilling windows, larger “no-disturbance” land areas and lower thresholds on the area within a specific geography that can be considered “disturbed” will lead to significant opportunity costs, and significantly reduce the overall number of projects that can be undertaken. This is especially important when one considers that there are many competing uses for specific geographical areas including ranching, wind farms, and fire roads. Fewer wells mean decreased output of domestically-produced oil and natural gas.

Restricted areas under the more stringent guidelines account for much of the overall land area of each of the states in question. Depending on the future restrictions regarding the GrSG, these areas may no longer be available for drilling activities. As Table 3 on page 5 shows, about a third of the land area of Wyoming falls within priority habitat, as does over 4 percent of Utah’s land area.

The areas of each of these states currently being developed for oil and natural gas extraction do not fall perfectly within these boundaries. In other words, much of the development activity occurs outside of areas than might be protected even under an endangered species listing. Existing well locations should serve as a good proxy for areas that might be attractive for future exploration. Based on this, priority areas would encompass about 55 percent of all of the potential new oil and natural gas development activities in Wyoming, approximately 13 percent in Utah and under 10 percent in both Colorado and Montana. Table 5 on page 6 outlines these percentages.

Potential areas open for drilling will differ depending on the scenario. In many proposed federal plan amendments, the BLM and USFS are considering utilizing four-mile seasonal no surface occupancy (NSO) buffers around leks, where development would be prevented or limited to narrow seasonal windows. Maps of actual lek sites are available from three of the four states, and a proxy built from average locations in Colorado, Utah and Wyoming is used to estimate the impacted areas in Montana. Table 10 shows the percentage of the total land area in each state within four miles of an existing lek. As the table shows, these areas are actually quite small, as each lek boundary area is just 50 square miles. But together these areas add up so that as much as 41.8 percent of the total land area of Wyoming is within four miles of an existing lek, as is nearly 17 percent of the state of Utah.

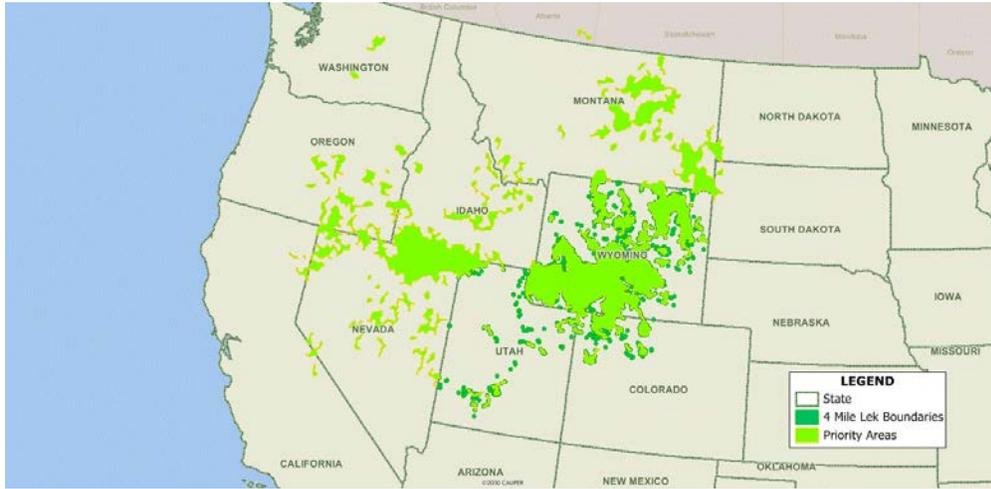
**Table 10**  
**Area Within Four Miles of a Lek**

<b>State</b>	<b>Total State Size (acres)</b>	<b>Area Within 4 Miles of Lek</b>	<b>Percent</b>
Colorado	66,379,520	3,711,360	5.59%
Montana	93,153,280	2,865,921	3.08%
Utah	52,572,160	8,833,280	16.80%
Wyoming	62,144,000	25,981,440	41.81%

Adding together the lek bands and the priority areas ensures that large areas of each of the states would face significant costs due to the reduction of “unrestricted” area for oil and natural gas exploration and development. Figure 4 on the following page shows these areas on a map.

Overall, the model assumes that anywhere between about 5 percent and 79 percent of land area currently available for mineral development could face substantial development restrictions depending on the state and scenario examined. As Table 11 shows, 61 percent of existing wells in Wyoming are in areas where restrictions could be imposed, nearly 15 percent in Montana are in these areas and about 4 percent in both Colorado and Utah.

**Figure 4**  
**Total Area within Four Miles of an Existing Lek and Priority GrSG Habitat Areas**



Note: Data on Montana leks are not available

On top of the restrictions on drilling or other activities near sensitive areas, the proposed restrictions contain specific thresholds on the percentage of anthropogenic disturbance that can be allowed in the area. Since areas considered disturbed include areas containing anything from existing energy development to cities and roads, most of the priority habitat areas already include large swaths of disturbed areas.<sup>15</sup>

**Table 11**  
**Wells located within Priority Habitat Areas**

State	Statewide Wells	Wells in Priority	
		Habitat	Percent
Colorado	63,026	2,395	3.8%
Montana	14,290	2,120	14.8%
Utah	17,864	765	4.3%
Wyoming	100,806	61,799	61.3%

In other words, four mile boundaries around nesting sites, where only limited human activity is allowed, are already likely to be impossible to delineate. Therefore, human activity restrictions could preclude any future drilling or other human activity in large areas of these states.

This is particularly important when one considers that much of the oil and natural gas development activity takes place in grassland and rangeland areas, rather than in the high elevation Rocky Mountains.

Looking across the four scenarios, the change in generally developable areas will fall substantially. All told, it is possible that as much as 88 percent of the areas currently open to oil

<sup>15</sup> Restrictions apply on all human activities including roads, railways, grazing pasture, even fence lines.

and natural gas exploration and development in Wyoming will face more severe restrictions depending on the scenario examined. (See Table 12 below)

**Table 12**  
**Potential Reduction in Developable Land Area in Priority Habitat**

Reduction in Available Developable Land	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Colorado	-5.42%	-6.12%	-8.72%	-9.42%
Montana	-8.22%	-10.65%	-34.40%	-36.83%
Utah	-13.38%	-19.16%	-20.06%	-25.84%
Wyoming	-55.57%	-78.71%	-78.71%	-87.57%

It should be noted that this does not mean that development could not occur on much of the restricted land area; however, there would be substantial restrictions put in place that would limit overall development and increase costs. This model focuses on the increased cost of development under the assumed restrictions.

Higher Reclamation Costs:

Another significant cost that could be imposed comes from increased reclamation requirements following any oil or natural gas development. Companies currently must implement significant and costly mitigation and reclamation programs whenever they operate in conjunction with GrSG. The BLM and USFS decisions are increasingly focused on improving or maintaining habitat for GrSG. This increased focus is reflected in the required Conditions of Approval (COA) for every drilling permit issued. According to a recent report on the breadth of conservation measures for GrSG taken in oil and natural gas projects on public lands, an average of 6.5 conservation measures that directly address threats to GrSG were required per decision record.<sup>16</sup> Additionally, on average, there was more than one required COA or conservation measure that required implementation of adaptive management and monitoring efforts.<sup>17</sup>

An examination of proposed GrSG restrictions in each of the four states shows that additional reclamation efforts will likely be required even if the bird is not listed as an endangered species. These efforts include the closure of certain habitat areas following the expiration of existing leases, a requirement that drilling and other equipment be brought in by helicopter or by existing roads, and required additional habitat restoration efforts on other parcels to help enhance GrSG habitat.

While a detailed cost analysis of these additional mitigation and reclamation efforts has not been undertaken, discussions with engineers and other company executives suggest that the cost could be as high as \$10,000 per new well.<sup>18</sup> This \$10,000 estimate has been used in this analysis as an illustrative figure. These higher reclamation costs would apply to all potential activity within the overall habitat areas under all of the four scenarios.

<sup>16</sup> SWCA Environmental Consultants, *Evaluation of the NEPA Process as an Adequate Regulatory Mechanism to Eliminate or Minimize Threats to Greater Sage-Grouse Associated with Oil and Natural Gas Development Activities*, Prepared for Western Energy Alliance, July 2014, at: [www.westernenergyalliance.org/sites/default/files/images/WesternEnergyAlliance\\_GrSG\\_NEPA\\_Final\\_071414.pdf](http://www.westernenergyalliance.org/sites/default/files/images/WesternEnergyAlliance_GrSG_NEPA_Final_071414.pdf)

<sup>17</sup> Ibid.

<sup>18</sup> Based on JDA's conversations with engineers and other executives from five independent producers over the summer of 2014.

### Higher Permitting Costs:

The proposed restrictions would lead to additional delays in processing APDs. Currently many BLM offices are unable to process APD applications in the timeframe required under federal law, with the agency itself admitting that it can take an average of up to 180 days to process an application. The addition of new surveys and Master Development Plans related to GrSG habitat would increase this processing time, adding to the carrying costs of a project. Since no direct estimates of these costs have been developed for illustrative purposes this analysis assumes that increased permitting costs would amount to approximately \$1,600 per new well based on discussions with operators. Were the GrSG to be listed this could rise significantly to as much as \$20,000 in order to meet any additional requirements imposed under a 4(d) rule.<sup>19</sup> This does not include additional delay costs which might be quite extensive, particularly on federal lands, lands with federal minerals, and Native American lands. This delay cost would apply were the GrSG to be listed.<sup>20</sup> Higher permitting costs are assumed to apply to all oil and natural gas production activities in the states in question.

### **Data and Model:**

This analysis is based on a model of the oil and natural gas production industry in 13 western states, which was developed for the Western Energy Alliance by JDA, a New York City-based economic consulting firm. It is based on a wide range of data sources and assumptions, each of which impacts the final results. JDA has strived to ensure that the assumptions are as cautious as possible leading to what is likely a low estimate of the overall cost of the proposed rule. Each of these assumptions, along with the data used in the development of the models, is detailed below:

Average Drilling Costs: are estimated based on data derived from the U.S. Department of Commerce, Bureau of Economic Analysis as compiled by IMPLAN Inc. in 2012.<sup>21</sup> These data

---

<sup>19</sup> Ibid.

<sup>20</sup> Delay times of up to 4 years are expected while the parameters of a 4(d) rule are developed. Under an Endangered designation the delay would apply to all projects in priority areas, while under a Threatened designation they would apply only to Federal leases. It is anticipated that the permitting costs would increase by about \$20,000, although, many operators are not confident that any APDs would be approved at all if the bird were to be listed.

<sup>21</sup> The IMPLAN model uses data from many different sources – as published government data series, unpublished data, sets of relationships, ratios, or as estimates. IMPLAN LLC gathers this data, converts it into a consistent format, and estimates the missing components. There are three different levels of data generally available in the United States: Federal, state and county. Most of the detailed data is available at the county level, and as such there are many issues with disclosure, especially in the case of smaller industries, such as brewing. IMPLAN overcomes these disclosure problems by combining a large number of datasets and by estimating those variables that are not found from any of them. The data is then converted into national input-output matrices (Use, Make, By-products, Absorption and Market Shares) as well as national tables for deflators, regional purchase coefficients and margins. The IMPLAN Make matrix represents the production of commodities by industry. The Bureau of Economic Analysis (BEA) Benchmark I/O Study of the US Make Table forms the bases of the IMPLAN model. The Benchmark Make Table is updated to current year prices, and rearranged into the IMPLAN sector format. The IMPLAN Use matrix is based on estimates of final demand, value-added by sector and total industry and commodity output data as provided by government statistics or estimated by IMPLAN. The BEA Benchmark Use Table is then bridged to the IMPLAN sectors. Once the re-sectoring is complete, the Use Tables can be updated based on the other data and model calculations of interstate and international trade. In the IMPLAN model, as with any input-output framework, all expenditures are in terms of producer prices. This allocates all expenditures to the industries that produce goods and services. As a result, all data not received in producer prices is converted using margins which are derived from the BEA Input-Output model. Margins represent the difference between producer and consumer prices. Deflators, which account for relative price changes during different time periods, are derived from the Bureau of Labor Statistics (BLS) Growth Model. The BLS model is mapped to the IMPLAN model. Where data are missing, deflators from BEA's Survey of Current Businesses are used. Finally, one of the most important parts of the IMPLAN model, the Regional Purchase Coefficients (RPCs) must be derived. IMPLAN is derived from a national model, which represents the "average" condition for a particular industry. Since national production functions do not necessarily represent particular regional differences, adjustments need to be made. Regional trade flows are estimated based on the Multi-Regional Input-Output Accounts.

come from the Input/Output accounts of the United States and provide detailed information on the input costs for oil and gas well drilling, including wages, capital costs and leasing costs, as well as costs for various materials and services used in the drilling and completion of oil and gas wells. The figures used in this model are based on the average cost per dollar of output (basically sales) multiplied by the estimated sale of oil and natural gas at the wellhead in each state. Annual average prices and production volumes by state are gathered from the US Department of Energy.<sup>22</sup> Costs are divided into well development stages, broadly ‘exploration, leasing and permitting’ and ‘drilling and completion’. Input and labor cost divisions are based on input commodity and service costs, with about 63 percent of the drilling/completion cost assumed to be for drilling and the rest for completion.<sup>23</sup>

Production Costs: Are derived from the IMPLAN model. These data present detailed figures on the input costs for oil and gas production, including wages, capital costs and leasing costs, as well as costs for various materials and services used in the exploration/leasing/permitting, production, infrastructure development and reclamation of oil and gas plays. The figures used in this model are based on the average cost per dollar of output (basically sales) multiplied by the estimated sale of oil and natural gas at the wellhead in each state as of 2012, which are the latest data available. Annual average prices and production volumes by state are gathered from the US Department of Energy.<sup>24</sup>

Drilling and production cost assumptions were taken from IMPLAN and then divided into eight components, representing four different types of production outcomes for both oil and natural gas wells. These types were: Dry holes (wells with zero production), small production (or stripper wells), medium production wells and large production wells. Breaks between small, medium and high production wells in each state came from the US Department of Energy, Energy Information Administration (EIA) and represent data from 2009 which is the last year for which data are available.<sup>25</sup> The total number of existing oil and gas wells in each state (as provided by each state licensing department) was then used to create a proxy of an “average well.” This serves as the unit of analysis in the model, but does not represent a physical well or field as might be developed by a specific company. It is rather an analytical tool that allows for shocks to the system, such as increased costs, to be used to measure percentage changes in economic activity.

Anticipated Revenues: Are based on data from the US Department of Energy. Revenues are simply equal to the annualized price of either oil or natural gas at the wellhead (by state) multiplied by annual production.<sup>26</sup> Revenues over the life of a well cannot be derived simply by dividing total revenues by the number of producing wells and multiplying by the expected life. This is because oil and gas wells tend to have either a hyperbolic or an exponentially declining production trend. Based on discussions with industry personnel, a well will generally not be drilled and put into production unless it can recoup at least the direct drilling and completion

---

<sup>22</sup> See for example: *Domestic Crude Oil First Purchase Prices by Area*, US Department of Energy, Energy Information Administration, at: [www.eia.gov/dnav/pet/pet\\_pri\\_dfp1\\_k\\_a.htm](http://www.eia.gov/dnav/pet/pet_pri_dfp1_k_a.htm)

<sup>23</sup> The model is based on average costs and revenues. These can vary greatly by play, product and individual well.

<sup>24</sup> See for example: *Domestic Crude Oil First Purchase Prices by Area*, US Department of Energy, Energy Information Administration, at: [www.eia.gov/dnav/pet/pet\\_pri\\_dfp1\\_k\\_a.htm](http://www.eia.gov/dnav/pet/pet_pri_dfp1_k_a.htm)

<sup>25</sup> *Distribution and Production of Oil and Gas Wells by State*, US Department of Energy, Energy Information Administration, January 7, 2011. Available on-line at: [www.eia.gov/pub/oil\\_gas/petrosystem/petrosysog.html](http://www.eia.gov/pub/oil_gas/petrosystem/petrosysog.html). Data retrieved May 6, 2014.

<sup>26</sup> Ibid.

costs in the first year after completion. In the case of this model, the lifetime expected return from an “average well” is modeled such that 80 percent of the discounted value will be recovered during the first four years of production.

The Number of Wells to be Drilled: Estimated based on data from individual state permitting authorities. Each authority uses different methods to identify whether wells are gas or oil (or both) and the wells’ stage in the production process. While complete standardization between the states is not possible, in general it is possible to label a well as “oil” or “gas,” and determine its stage of pre-production. Again, these are analytical “average wells” which are calculated for each individual state based on current conditions, but do not necessarily represent fields that a specific company may actually drill and develop.

The number of potentially impacted wells on Federal and federally-controlled lands is based on the assumption that about 4,000 APDs are granted each year. In the states being examined, the number averaged about 3,600 per year.<sup>27</sup>

The Number of Producing Wells: Estimated based on data from individual state permitting authorities. Again, each authority uses different methods to identify whether wells are gas or oil (or both) and the wells’ stage of production. While complete standardization between the states is not possible, in general it is possible to label a well as “oil” or “gas,” and determine its stage of production. Water wells, disposal wells, capped wells, injection wells, and other operations not directly used to extract petroleum are not included.

### **Modeling GrSG Related Restrictions:**

Individual cost elements are derived for each of the four cost areas directly impacted by GrSG regulations using the model described above and based on discussions with various company engineers.<sup>28</sup> These costs are:

- Higher overall drilling and completion costs resulting from reduced time windows;
- Higher permitting costs and monetary expenses resulting from increased delays;
- Higher reclamation costs; and
- Higher costs due to restrictions on drilling areas, and anthropomorphic disturbances.

Costs for each of these categories are calculated and then entered into the model for each type of well, type of predominant product (oil or natural gas) and specific state. The resulting higher development and production costs reduce the overall level of return of oil and natural gas development in each specific region and for each product type. For example, in the wake of the implementation of the proposed federal GrSG protection plan, it is highly likely that drilling companies would be forced to reduce their activity season, which is the season that they build roads, set pads, lay concrete, and commence actual drilling operations. To make up for the lost days, it is probable that drilling companies will hire more workers to speed up the drilling

---

<sup>27</sup> Based on data for the past 10 years. About 70 percent of all APD’s issued by the Bureau of Land Management have been in these four states. In FY 2013, the last year for which data are available, only 2,300 were issued. See: *Number of Drilling Permits Approved by Fiscal Year on Federal Lands*, US Department of the Interior, Bureau of Land Management, November 18, 2013 at: [www.blm.gov/wo/st/en/prog/energy/oil\\_and\\_gas/statistics.html](http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/statistics.html)

<sup>28</sup> Based on JDA’s conversations with engineers and other executives from five companies over the summer of 2014.

process, which will increase demand for drilling services in the reduced activity season. If energy companies expect the price of drilling services to increase in the future (a reasonable expectation in the wake of federal GrSG regulations), current demand for drilling and completion crews will increase, and drilling service companies will hire more employees to meet this demand.

The U.S. Energy Information Administration has provided estimates for the cost-per-well incurred by drilling companies.<sup>29</sup> Unfortunately, cost-per-well estimates are only reported up to 2007, so JDA has estimated 2008 through 2012. JDA’s estimates indicate that in 2012 the U.S. nominal cost per crude oil well drilled was around \$3.2 million.

According to the Bureau of Labor Statistics, the average number of production and non-supervisory employees in the oil and gas extraction industry in 2012 was 106,300.<sup>30</sup> Considering that the cost per well is a function of the number of production and nonsupervisory employees in the oil and gas extraction industry, changes in employment can be used to estimate future costs per well. Based on this model, the demand elasticity for drilling and production equipment is developed using employment levels as a proxy for demand. Based on the available data, the elasticity for oil drilling is almost unitary – about -0.96, so a 10 percent increase in demand will equate to a 9.6 percent increase in prices.

Based on these changes, the models are recalibrated to calculate changes to the “average well” and to remove marginal production to a point where overall market resets to the original return percentage. In some cases costs are adjusted to reflect how they are applied. For example, permitting costs for Federal permits are considerably higher than those on fee and state lands.

Table 13 outlines the basic cost categories and the parameters that are entered into the models.

**Table 13**  
**Cost Assumptions for Each Modeling Scenario**

Parameter	Scenario 1	Scenario 2	Scenario 3	Scenario 4
<b>Increases in Permitting Costs</b>				
Administrative and Consulting Costs	\$1,600	\$1,600	\$20,000	\$20,000
Cost of Increased Delay Time	\$0	\$0	\$7,897	\$15,635
<b>Increase in Reclamation Costs</b>				
Additional Cost per Well	\$10,000	\$10,000	\$10,000	\$10,000
Reduction in Available Developable Land	<b>Scenario 1</b>	<b>Scenario 2</b>	<b>Scenario 3</b>	<b>Scenario 4</b>
Colorado	-5.42%	-6.12%	-8.72%	-9.42%
Montana	-8.22%	-10.65%	-34.40%	-36.83%
Utah	-13.38%	-19.16%	-20.06%	-25.84%
Wyoming	-55.57%	-78.71%	-78.71%	-87.57%
<b>Increased Drilling and Completion Costs from Timing Restrictions</b>				
Oil Wells	1.55%	2.48%	2.48%	2.48%
Gas Wells	1.51%	2.42%	2.42%	2.42%

<sup>29</sup> U.S. Nominal Cost per Crude Oil Well Drilled, U.S. Energy Information Administration, Release date August 29, 2014. Available at: [http://www.eia.gov/dnav/ng/hist/ertwo\\_xwwn\\_nus\\_mdwa.htm](http://www.eia.gov/dnav/ng/hist/ertwo_xwwn_nus_mdwa.htm)

<sup>30</sup> Employment, Hours, and Earnings from the Current Employment Statistics survey (National,) Bureau of Labor Statistics, September 2, 2014. Available: see [http://data.bls.gov/timeseries/CEU1021100006?data\\_tool=Xgtable](http://data.bls.gov/timeseries/CEU1021100006?data_tool=Xgtable)

The resulting change in the number of average wells that would remain profitable (in percentage terms) is used as a proxy for the percent of new wells that would be not drilled under the restrictive GrSG regulations. The percentage change is assumed to be linearly related to the impact change.

### **Results:**

Were the species to be listed as a *threatened* or *endangered* species, drilling activities could be impacted on all lands in the species' range, and it would be likely that almost no further oil or natural gas development would occur in vast areas of the four states studied. In all cases, the overall economic impact could be quite large. As many as 18,250 jobs could be lost nationwide were the GrSG to be listed as endangered. Overall, the economy would face a \$4.8 billion annual economic loss simply due to reduced drilling and development activities. State and local governments across the country could lose as much as \$295.6 million<sup>31</sup> in annual tax revenues, not including revenues from lease and royalty payments.

It should be noted that reductions in exploration, drilling and development operations in these states do not just impact the local or regional economy, but the national economy as well. A substantial amount of equipment, services and supplies are purchased from suppliers located throughout the United States. These impacts, along with induced impacts in those economies, are included in the national figure in the table on the following page.

---

<sup>31</sup> Scenario Four on Table 25

**Table 14**  
**Estimated Annual Economic Impact of GrSG Restrictions Upon Full Implementation**

(\$ Millions)	Job Impact	Wage Impact	Output Impact	Tax Impact
<b>Scenario 1</b>				
Colorado	(4,088)	(\$359.69)	(\$1,202.26)	(\$111.32)
Montana	(900)	(\$63.58)	(\$225.75)	(\$20.83)
Utah	(646)	(\$40.98)	(\$134.95)	(\$13.29)
Wyoming	(1,027)	(\$90.79)	(\$387.53)	(\$38.73)
United States	(9,172)	(\$697.05)	(\$2,435.13)	(\$347.68)
<b>Scenario 2</b>				
Colorado	(4,111)	(\$361.68)	(\$1,208.90)	(\$111.94)
Montana	(907)	(\$64.08)	(\$227.53)	(\$20.99)
Utah	(670)	(\$42.50)	(\$139.96)	(\$13.78)
Wyoming	(1,040)	(\$91.97)	(\$392.55)	(\$39.24)
United States	(9,267)	(\$704.22)	(\$2,460.18)	(\$351.14)
<b>Scenario 3</b>				
Colorado	(7,432)	(\$653.88)	(\$2,185.56)	(\$202.37)
Montana	(1,242)	(\$87.74)	(\$311.53)	(\$28.74)
Utah	(1,700)	(\$107.89)	(\$355.25)	(\$34.99)
Wyoming	(2,065)	(\$182.54)	(\$779.15)	(\$77.88)
United States	(16,810)	(\$1,277.43)	(\$4,462.71)	(\$643.63)
<b>Scenario 4</b>				
Colorado	(8,077)	(\$710.60)	(\$2,375.13)	(\$219.93)
Montana	(1,295)	(\$91.47)	(\$324.76)	(\$29.96)
Utah	(1,953)	(\$123.96)	(\$408.18)	(\$40.20)
Wyoming	(2,244)	(\$198.38)	(\$846.74)	(\$84.63)
United States	(18,259)	(\$1,387.57)	(\$4,847.48)	(\$700.21)

Overall, it is estimated that the potential restrictions related to the GrSG, were they applied only on state and fee lands in the four states, will have a sizable impact on oil development. Reduction in oil development could be as high as 28 percent in Colorado based simply on the restrictions currently being developed by the BLM. Natural gas well development would likely undergo similar dramatic reductions (See Table 15 and Table 16). For example, based on the proposed restrictions, development of natural gas wells in Montana could be off by about 40 percent, though from an admittedly low base, and developments in Colorado and Utah could be off by about 6 percent. This is partly due to the fact that prices for natural gas are currently quite low.

**Table 15**  
**Annualized Reduction in Oil Development in Four Selected States From Baseline After Restrictions Are Fully Implemented**

Scenario	Colorado	Montana	Utah	Wyoming
Scenario One	-27.59%	-6.82%	-10.49%	-20.14%
Scenario Two	-27.74%	-6.93%	-10.54%	-20.34%
Scenario Three	-47.05%	-15.55%	-26.09%	-36.98%
Scenario Four	-49.82%	-17.26%	-29.39%	-39.54%

Were the restrictions to apply only to federal leases, the resulting decreases would be slightly smaller mainly due to the fact that so few wells are currently drilled on federal leaseholds in the states.

Even though development could be significantly depressed by the proposed rules, were the FWS to list the GrSG as a threatened or endangered species, the effect on domestic oil and natural gas production in these four states could be dramatic. In fact, discussions with industry officials suggest that many companies would pull out completely and transfer resources to fields in Texas and Oklahoma and even to less productive plays in the Marcellus Shale.<sup>32</sup>

**Table 16**  
**Annualized Reduction in Natural Gas Development in Four Selected States From Baseline After Restrictions Are Fully Implemented**

Scenario	Colorado	Montana	Utah	Wyoming
Scenario One	-5.97%	-39.73%	-5.36%	-2.79%
Scenario Two	-6.02%	-39.99%	-5.82%	-2.86%
Scenario Three	-13.97%	-49.48%	-15.30%	-7.32%
Scenario Four	-16.50%	-50.66%	-18.04%	-8.27%

The model results bear this out. If the GrSG were to be listed as endangered, it is likely that almost half of the development of oil in Colorado could be curtailed.<sup>33</sup> These figures are actually modest. Estimates of the impact of restrictions in Wyoming made by Willms and Alexander (2014) who suggest that about 4,000 jobs would be lost in the state as a result of listing the GrSG.<sup>34</sup> Even under the worst case scenario, this model suggests that about 2,244 total jobs would be lost in Wyoming, out of about 18,250 nationwide.

**Table 17**  
**Estimated Overall Annualized Reduction in Oil and Natural Gas Development**

Scenario	Colorado	Montana	Utah	Wyoming
Scenario One	-16.78%	-24.41%	-7.62%	-8.45%
Scenario Two	-16.88%	-24.60%	-7.90%	-8.56%
Scenario Three	-30.51%	-33.68%	-20.06%	-17.00%
Scenario Four	-33.16%	-35.11%	-23.05%	-18.47%

Interestingly, increased drilling costs resulting from greater demand for manpower and equipment during shorter drilling windows did not have as sizable an impact as one might have thought. This is due to the fact that the windows where drilling is strictly prohibited, while increasing in some areas fell in others. However, were these restrictions to be tightened and drilling windows to be made even shorter, it is likely that these costs could rise dramatically.

<sup>32</sup> Note that the analysis presented here does not take into account the impact of any substitution effects on other states and regions, as the data are limited to just the 13 western states.

<sup>33</sup> Were petroleum prices to continue to fall the impacts could be even greater as more and more projects would become marginal economically.

<sup>34</sup> Willms, David and Anne Alexander, *The North American Model Of Wildlife Conservation In Wyoming: Understanding It, Preserving It, And Funding Its Future*, *Wyoming Law Review*, Volume 14, Number 2, 2014.

**Table 18**  
**Estimated Annual Economic Impact of GrSG Restrictions (Scenario 1)**

State	Direct Jobs	Total Jobs	Direct Wages	Total Wages	Direct Output	Total Output
Colorado	(2,779)	(4,088)	\$ (278,031,570)	\$ (359,693,772)	\$ (991,588,763)	\$ (1,202,260,420)
Montana	(561)	(900)	\$ (49,236,833)	\$ (63,581,084)	\$ (179,802,530)	\$ (225,751,450)
Utah	(328)	(646)	\$ (25,701,284)	\$ (40,983,753)	\$ (87,301,301)	\$ (134,948,764)
Wyoming	(841)	(1,027)	\$ (81,596,860)	\$ (90,792,795)	\$ (358,656,271)	\$ (387,525,650)
Entire United States	(4,009)	(9,172)	\$ (370,254,431)	\$ (697,046,111)	\$ (1,339,180,832)	\$ (2,435,129,776)

The reductions in petroleum development will impact the economy throughout the United States; however, the largest impact will be in the states where drilling activity is actually precluded, and in Colorado, where much of the planning and management of these activities take place.

Based on the 2014 economic impact model of the oil and natural gas production industry in the western United States, the overall cost of increased state level restrictions – were they to apply to all state and fee lands, both private and public could be significant. In fact, it is estimated that over 9,170 jobs would be lost, paying workers as much as \$697.0 million in wages. The overall cost to the economy could be over \$2.4 billion, and governments in these four states would see \$75.4 million less in tax revenues.<sup>35</sup>

**Table 19**  
**Estimated Fiscal Impact of GrSG Restrictions (Scenario 1)**

State	Federal Taxes	State Taxes	Total Taxes
Colorado	\$ (67,308,000)	\$ (44,016,000)	\$ (111,324,000)
Montana	\$ (12,068,000)	\$ (8,761,000)	\$ (20,829,000)
Utah	\$ (6,812,000)	\$ (6,479,000)	\$ (13,291,000)
Wyoming	\$ (22,540,000)	\$ (16,194,000)	\$ (38,734,000)
United States	\$ (201,362,666)	\$ (146,320,410)	\$ (347,683,075)

These tax revenues represent just business and personal taxes lost due to the loss of economic activity like exploration, drilling and reclamation. States would also lose various severance taxes, lease royalties or other fees related to the lost production of petroleum.

**Table 20**  
**Estimated Annual Economic Impact of GrSG Restrictions (Scenario 2)**

State	Direct Jobs	Total Jobs	Direct Wages	Total Wages	Direct Output	Total Output
Colorado	(2,794)	(4,111)	\$ (279,568,050)	\$ (361,681,540)	\$ (997,068,558)	\$ (1,208,904,445)
Montana	(565)	(907)	\$ (49,624,409)	\$ (64,081,574)	\$ (181,217,877)	\$ (227,528,491)
Utah	(341)	(670)	\$ (26,654,803)	\$ (42,504,253)	\$ (90,540,186)	\$ (139,955,374)
Wyoming	(852)	(1,040)	\$ (82,654,868)	\$ (91,970,040)	\$ (363,306,707)	\$ (392,550,414)
Entire United States	(4,051)	(9,267)	\$ (374,063,126)	\$ (704,216,413)	\$ (1,352,956,579)	\$ (2,460,179,219)

The impacts would be even larger were the restrictions currently being contemplated by the BLM to be imposed on federal and federally controlled leaseholds as well as on fee lands. In this case, the overall economic impact would be about 9,270 jobs, with the bulk of them in Colorado and Wyoming.

<sup>35</sup> Not including revenues from leases and royalties.

Under this scenario, state and local revenues across the United States resulting from the reduced economic activity would fall by about \$147.8 million and total federal, state and local revenues would be off by \$351.1 million.

**Table 21**  
**Estimated Annual Fiscal Impact of GrSG Restrictions (Scenario 2)**

State	Federal Taxes	State Taxes	Total Taxes
Colorado	\$ (67,680,000)	\$ (44,259,000)	\$ (111,939,000)
Montana	\$ (12,163,000)	\$ (8,830,000)	\$ (20,993,000)
Utah	\$ (7,065,000)	\$ (6,719,000)	\$ (13,784,000)
Wyoming	\$ (22,832,000)	\$ (16,404,000)	\$ (39,236,000)
United States	\$ (203,327,514)	\$ (147,811,983)	\$ (351,139,498)

The economic impact grows if the GrSG were to be listed as an endangered or threatened species by the FWS. Using a fairly restrictive definition of how this listing would actually work, it is likely that overall oil and natural gas development in these four states could be seriously impacted. Overall petroleum development could fall by as much as 34 percent in these states, not just because certain areas would be closed for exploration for an extended period of time, but because permitting and reclamation costs would soar particularly in priority areas – even those that may not currently contain GrSG habitat. Higher costs would make many marginal projects no longer economical, and would seriously hamper new development activity. Based on the model, were the FWS to list the GrSG as threatened, there could be a loss of nearly 16,800 jobs in the oil and natural gas industry overall, with about 12,440 in these four states. Overall economic activity in the country would fall by about \$4.5 billion.<sup>36</sup>

**Table 22**  
**Estimated Annual Economic Impact of GrSG Restrictions (Scenario 3)**

State	Direct Jobs	Total Jobs	Direct Wages	Total Wages	Direct Output	Total Output
Colorado	(5,052)	(7,432)	\$ (505,426,506)	\$ (653,878,143)	\$ (1,802,583,945)	\$ (2,185,558,582)
Montana	(773)	(1,242)	\$ (67,945,625)	\$ (87,740,341)	\$ (248,123,094)	\$ (311,531,480)
Utah	(865)	(1,700)	\$ (67,658,560)	\$ (107,889,619)	\$ (229,820,440)	\$ (355,252,257)
Wyoming	(1,692)	(2,065)	\$ (164,055,725)	\$ (182,544,742)	\$ (721,101,452)	\$ (779,145,192)
Entire United States	(7,348)	(16,810)	\$ (678,542,467)	\$ (1,277,433,430)	\$ (2,454,234,141)	\$ (4,462,712,199)

There would be significant impacts on personal and business tax revenues as a result of these jobs losses. A threatened listing could cost the four states as much as \$141.7 million and the loss in overall federal, state and local loss in tax revenues would be as high as \$643.6 million.

Finally, were the GrSG to be listed as endangered by the FWS, it is likely that petroleum exploration and development activities would cease in large areas across the range of the species while new regulations are being developed. This would lead to a reduction of about 18,250 jobs nationwide including direct and supplier firms and those jobs induced by their activities. This would reduce economic activity in the country by about \$4.8 billion.

<sup>36</sup> This scenario reflects the net present value of a 4 year delay on any development in federally permitted priority areas.

**Table 23**  
**Estimated Annual Fiscal Impact of GrSG Restrictions (Scenario 3)**

State	Federal Taxes	State Taxes	Total Taxes
Colorado	\$ (122,357,000)	\$ (80,015,000)	\$ (202,372,000)
Montana	\$ (16,653,000)	\$ (12,090,000)	\$ (28,743,000)
Utah	\$ (17,932,000)	\$ (17,055,000)	\$ (34,987,000)
Wyoming	\$ (45,319,000)	\$ (32,558,000)	\$ (77,877,000)
United States	\$ (372,027,747)	\$ (271,600,040)	\$ (643,627,787)

There would be significant impacts on personal and business tax revenues as a result of these jobs losses. An endangered listing could cost the four states as much as \$154.5 million and the overall federal, state and local loss in tax revenues would be as high as \$700.2 million.

**Table 24**  
**Estimated Annual Economic Impact of GrSG Restrictions (Scenario 4)**

State	Direct Jobs	Total Jobs	Direct Wages	Total Wages	Direct Output	Total Output
Colorado	(5,490)	(8,077)	\$ (549,266,895)	\$ (710,595,137)	\$ (1,958,938,985)	\$ (2,375,132,610)
Montana	(806)	(1,295)	\$ (70,831,645)	\$ (91,467,150)	\$ (258,662,229)	\$ (324,763,913)
Utah	(994)	(1,953)	\$ (77,739,456)	\$ (123,964,805)	\$ (264,062,904)	\$ (408,183,636)
Wyoming	(1,838)	(2,244)	\$ (178,289,200)	\$ (198,382,325)	\$ (783,664,216)	\$ (846,743,831)
Entire United States	(7,981)	(18,259)	\$ (737,045,802)	\$ (1,387,572,618)	\$ (2,665,836,052)	\$ (4,847,483,322)

These four scenarios suggest that the more stringent the limitations on exploration, production and distribution of oil and natural gas imposed due to the GrSG, the more extensive the economic impact will be. Most importantly, they show that much of the impact will occur far from where actual GrSG activity occurs, in part due to the costly nature of delays and the bureaucratic permitting process that would surround any listing of the bird.

**Table 25**  
**Estimated Annual Fiscal Impact of GrSG Restrictions (Scenario 4)**

State	Federal Taxes	State Taxes	Total Taxes
Colorado	\$ (132,971,000)	\$ (86,955,000)	\$ (219,926,000)
Montana	\$ (17,360,000)	\$ (12,604,000)	\$ (29,964,000)
Utah	\$ (20,604,000)	\$ (19,597,000)	\$ (40,201,000)
Wyoming	\$ (49,250,000)	\$ (35,383,000)	\$ (84,633,000)
United States	\$ (404,589,113)	\$ (295,618,216)	\$ (700,207,329)

### **About John Dunham and Associates:**

JDA is a leading New York City based economic consulting firm specializing in the economics of fast moving issues. JDA is an expert at translating complex economic concepts into clear, easily understandable messages that can be transmitted to any audience. Our company's clients include a wide variety of businesses and organizations, including some of the largest Fortune 500 companies in America, such as:

- Altria
- Diageo
- Feld Entertainment
- Forbes Media
- MillerCoors
- Verizon
- Wegmans Stores

John Dunham is a professional economist with over 25 years of experience. He holds a Master of Arts degree in Economics from the New School for Social Research as well as a Masters of Business Administration from Columbia University. He also has a professional certificate in Logistics from New York University. Mr. Dunham has worked as a manager and an analyst in both the public and private sectors. He has experience in conducting cost-benefit modeling, industry analysis, transportation analysis, economic research, and tax and fiscal analysis. As the Chief Domestic Economist for Philip Morris, he developed tax analysis programs, increased cost-center productivity, and created economic research operations. He has presented testimony on economic and technical issues in federal court and before federal and state agencies.

Prior to Phillip Morris John was an economist with the Port Authority of New York and New Jersey.