# APPENDIX 26—SOCIOECONOMIC IMPACT ANALYSIS ASSUMPTIONS AND METHODS

## MODIFICATIONS OF IMPLAN FOR THE PLANNING AREA

The IMPLAN modeling system is based on national production coefficients. To better reflect local production practices, the oil and gas and cattle production sectors of the three-county IMPLAN model for the Pinedale RMP were modified. The IMPLAN sectors associated with recreation were not adjusted because it was believed that they were a reasonably accurate representation of the sectors found in the study area.

In IMPLAN, oil and gas production is divided into three sectors: 38. Natural Gas and Crude Petroleum (production); 39. Natural Gas Liquids (by-products); and 57. Maintenance and Repair of Oil and Gas Wells (oil and gas field services). Employment for these three sectors was estimated from Wyoming Department of Employment data on covered employment. These estimates were then adjusted to account for self-employment based on Wyoming data from the Bureau of Economic Analysis, U.S. Department of Commerce. Labor earnings for the three sectors were also estimated from Wyoming Department of Employment data. These estimates were then adjusted for self-employment earnings and benefits. Benefits were estimated from national data in the Survey of Current Business.

Total industry output for production was based on the quantities of production data in the Wyoming Department of Revenue's Annual Report and price forecasts from the Wyoming Consensus Revenue Estimating Group (CREG). Total industry output for by-products was estimated from information on county gas plant products from Minerals Management Services. Total industry output for oil and gas field services was estimated using output/employment ratios developed from the 1997 Economic Census, U.S. Census Bureau. As a result of the large price fluctuations in natural gas and oil prices, the economic impacts of production were estimated based on cost of production rather than total output.

In IMPLAN, the cattle ranching industry is separated into two sectors: 3. Ranch Feed Cattle and 4. Range Feed Cattle. For this analysis, sectors 3 and 4 were combined into a single Cattle Ranching sector. The production coefficients for this aggregated cattle ranching sector were then modified based on a University of Idaho Cow-Calf Budget. This budget was considered to be a more accurate reflection of production practices in the study area. The sheep sector production coefficients were not modified. Because of price fluctuations, the 2000–2005 average value of production estimates from the Wyoming Agricultural Statistics was used to estimate per animal unit month (AUM) values for cattle production. The quantity of production was estimated based on Wyoming Agricultural Statistics data on cattle inventories by county. Finally, regional purchase coefficients were adjusted to reflect current purchasing patterns in the study area.

## OIL AND GAS EXPLORATION AND DEVELOPMENT

The economic impacts of oil and gas operations were analyzed in two phases:

- Phase I: Exploration and Development
- Phase II: Production.

Phase 1 considered how many exploratory and development wells would be drilled under each alternative in the planning area and what percentage of these wells would be completed. This includes both

conventional wells and coalbed natural gas development. Table A26-1 summarizes the assumptions used in analyzing the development phase. Oil and gas costs and employment were assumed to be a weighted average of the Pinedale Anticline, Jonah Field, wells near Jonah Field figures. Helium production was considered a byproduct of gas production.

**Table A26-1. Economic Assumptions for Gas Exploration and Development (Costs per Well, 2003$)**

| Impacts | Well Location | | | | |
|---|---|---|---|---|---|
| | Pinedale Anticline | Jonah Field | Wells Near Jonah Field | Coalbed Methane | Other Wells in Planning Area |
| Drilling Costs | $2,264,900 | $766,800 | $568,000 | $400,000 | $340,800 |
| Completion Costs | $1,952,500 | $1,789,200 | $568,000 | $275,000 | $369,200 |
| Drilling Jobs | 23.2 | 9.0 | 5.9 | 4.0 | 3.6 |
| Completion Jobs | 11.0 | 11.7 | 3.3 | 1.5 | 2.2 |
| Drilling Earnings | $1,211,243 | $478,872 | $310,046 | $206,378 | $188,765 |
| Completion Earnings | $546,729 | $582,929 | $161,866 | $74,027 | $106,180 |
| Percentage of Wells on Federal Lands | Variable | Variable | Variable | Variable | Variable |

Additionally, well projections were provided from the BLM Reservoir Management Group for the number of wells drilled, completed and brought to production as well as the number of wells, drilled, plugged, and abandoned. Federal well numbers projections were determined by the percentage of Federal projected wells in 2020. This information is summarized in Table A26-2.

**Table A26-2. Total Well Projections Alternatives**

| Year | Alternative 1 | | Alternative 2 | | Alternative 3 | | Alternative 4 | |
|---|---|---|---|---|---|---|---|---|
| | Completed Wells | P&A Wells[1] | Completed Wells | P&A Wells[1] | Completed Wells | P&A Wells[1] | Completed Wells | P&A Wells[1] |
| 2001-2005 | 1,714 | 235 | 1714 | 268 | 1,714 | 35 | 1,714 | 217 |
| 2006 | 399 | 55 | 428 | 67 | 332 | 7 | 402 | 51 |
| 2007 | 407 | 56 | 436 | 68 | 340 | 7 | 410 | 52 |
| 2008 | 407 | 56 | 437 | 68 | 340 | 7 | 411 | 52 |
| 2009 | 444 | 61 | 472 | 74 | 356 | 7 | 445 | 56 |
| 2010 | 467 | 64 | 501 | 78 | 363 | 7 | 470 | 59 |
| 2011 | 467 | 64 | 500 | 78 | 383 | 8 | 469 | 59 |
| 2012 | 467 | 64 | 500 | 78 | 388 | 8 | 469 | 59 |
| 2013 | 392 | 54 | 425 | 67 | 313 | 6 | 395 | 50 |
| 2014 | 261 | 36 | 295 | 46 | 203 | 4 | 264 | 33 |
| 2015 | 262 | 36 | 297 | 46 | 206 | 4 | 269 | 34 |
| 2016 | 292 | 40 | 327 | 51 | 219 | 4 | 288 | 36 |

| Year | Alternative 1 | | Alternative 2 | | Alternative 3 | | Alternative 4 | |
|---|---|---|---|---|---|---|---|---|
| | Completed Wells | P&A Wells[1] | Completed Wells | P&A Wells[1] | Completed Wells | P&A Wells[1] | Completed Wells | P&A Wells[1] |
| 2017 | 342 | 47 | 378 | 59 | 225 | 5 | 347 | 44 |
| 2018 | 327 | 45 | 343 | 54 | 172 | 3 | 315 | 40 |
| 2019 | 430 | 59 | 430 | 67 | 430 | 9 | 430 | 54 |
| 2020 | 345 | 47 | 345 | 54 | 345 | 7 | 345 | 44 |
| **Total** | **7,421** | **1,018** | **7,826** | **1,225** | **6,328** | **128** | **7,443** | **940** |
| **Total Well Projections** | **8,439** | | **9,051** | | **6,456** | | **8,383** | |
| **Federal Wells** | **7,192** | | **7,804** | | **5,209** | | **7,136** | |

[1]Wells that were drilled, plugged and abandoned.
Source: BLM Reservoir Management Group

According to local industry representatives, approximately 81% of well drilling and completion costs were assumed to be incurred within the study area. It was further assumed that drilled, plugged and abandoned wells were only associated with oil and conventional gas wells, and not coalbed methane wells as indicated by industry interviews. Additionally, drilled, plugged and abandoned wells were assumed to comprise two-thirds of the total costs to bring a well into production. For all employment and income impacts, it was assumed that only 40% of the induced impact stays within the local study area.

Phase II considered the economic impact of producing additional gas reserves as a result of the exploration and development under Phase I. Table A26-3 summarizes the economic assumptions used to analyze gas and helium production estimated to occur under each alternative. Note that these assumptions represent economic impacts to the three-county study area and do not represent total earnings over the life of the well.

## Table A26-3. Economic Assumptions for Gas and Helium Production

| Inputs/ Impacts | Type of Product | | |
|---|---|---|---|
| | Conventional Gas (MMCF) | Coalbed Natural Gas (MMCF) | Oil (Condensate) (MB) |
| Price/[a,] | $5,020 | $5,020 | $50,000 |
| Labor Earnings | $124.75 | $124.75 | $831.85 |
| Employment | .002324 | 0.002324 | 0.015497 |

[a] Prices for natural gas were obtained from the Wyoming State Consensus Revenue Estimating Group, January 2006.

The average price of natural gas and oil used for this analysis was obtained from the Wyoming State Government Revenue Forecast, published in January 2006. The average price forecast for natural gas for estimated to be $5.02 ($/mcf) and for oil was $50 ($/bbl).

# GRAZING

Grazing activities were analyzed under each alternative as follows. First, historical grazing use within the planning area was determined. The value of grazing AUMs for cattle and sheep were estimated as shown in Table A26-4. AUM data was obtained from the Wyoming Agricultural Statistical Service as shown in columns 2 and 3 and include the value of cattle sold in Wyoming. Total cattle sales were divided by the number of cows that had calved, which provided a value per cow sold as summarized in column 4. The value per cow was then divided by an AUM conversion factor resulting in an estimated value per AUM.

**Table A26-4. Estimated Value of Cattle AUMs**

| Year | Value of Production (1,000$s)[a] | Cows that have Calved (1,000 Head)[a] | Value Per Cow | Conversion to AUMs (AUMs/cow)[b] | Value of Production Per AUM Nominal $s | Value of Production Per AUM Real (2001$) |
|---|---|---|---|---|---|---|
| 2001 | $542,187 | 850 | $637.87 | 16 | $39.87 | $43.59 |
| 2002 | $449,894 | 820 | $548.65 | 16 | $34.29 | $36.81 |
| 2003 | $506,424 | 720 | $703.37 | 16 | $43.96 | $46.36 |
| 2004 | $596,546 | 760 | $784.93 | 16 | $49.06 | $50.73 |
| 2005 | $593,737 | 760 | $781.23 | 16 | $48.83 | $48.83 |
| **5-yr Average** | | | | | | **$45.26** |

[a] Wyoming Agricultural Statistics

[b] J.P. Workman, *Range Economics*, 1986, McMillian Publishing, Inc. New York, New York.

The economic analysis used the 5-year average value of AUMs, or $45.26/AUM for cattle in inflation-adjusted dollars (2005$). The value and number of AUMs per alternative were then used in combination with the IMPLAN model to estimate economic impacts of grazing under each alternative. The economic assumptions used to analyze grazing impacts are summarized in Table A26-5.

**Table A26-5. Economic Assumptions for Grazing**

| | Cattle Grazing (2005$) | Sheep Grazing (2005$) |
|---|---|---|
| Production Value Per AUM | $45.26 | $30.61 |
| Total Economic Impact Per AUM | $78.55 | $59.97 |
| Earnings Per AUM | $23.68 | $8.25 |
| Jobs Per AUM | 0.000709 | 0.000951 |

# RECREATION

Recreational impacts were analyzed as follows. The number of Recreational Visitor Days (RVD) was estimated for each alternative, considering several assumptions. These assumptions are summarized in Table A26-6. Once the number of RVDs was estimated by activity, the RVDs were separated into

resident and nonresident use and analyzed separately. Residents were considered as any individual living in the three-county study area, whereas nonresidents lived outside the three-county region. Residents of the study area associated with big game hunting were determined by evaluating zip codes of hunters that applied for licenses from the Wyoming Game and Fish Department within the relevant hunting areas. Residents and nonresidents participating in off-highway vehicle (OHV) and other dispersed use were based on observations of the BLM staff for this area.

The economic impact of recreation in the planning area considered activities of nonresidents only. Regional economic impact modeling (I/O models) evaluates the additional economic activity associated with "new" money brought into an economy. This action can occur as goods and services are produced by local firms and exported to entities outside the region (e.g., agricultural products, oil and gas production). In addition, new money can come into an economy as visitors come to the area and spend money. I/O models estimate the additional economic activity that occurs with the new money expenditures. Therefore, nonresident spending is evaluated when determining the economic impacts of recreation. However, this does not imply that recreational activities are not important to the quality of life of residents in the area.

Total annual recreational expenditures of nonresidents were estimated for each alternative using the estimated RVDs per activity and the average expenditures per day per activity. Table A26-7 summarizes the average expenditures for each activity. The economic assumptions used to estimate recreational impacts are summarized in Table A26-8.

## Table A26-6. Recreation Assumptions

| Use Type | Alternative 1 | Alternative 2 | Alternative 3 | Alternative 4 |
|---|---|---|---|---|
| **Nonconsumptive** | | | | |
| **OHV** | OHV use is estimated to increase by 1.5% per year during the planning period based on current trends in OHV use. | OHV use is expected to increase 2% per year. Increases in OHV use are expected as a result of the creation of the Rawlins OHV SRMA. Also, an increase is expected in the number of roads and trails open to OHV use as a result of changes in wildlife management restrictions and increased mineral development. | OHV use is expected to decrease by only 10% per year under Alternative 3. | OHV use is estimated to remain constant at annual average RVD use. |
| **Snowmobiling** | Remain at annual average. | Remain at annual average. | Slight decrease in use resulting from seasonal restrictions surrounding the Continental Divide Trail. | Remain at annual average. |
| **Other Recreational Uses** | Nonconsumptive RVDs are estimated to increase by 1.5% per year over the study period based on current trends. | Nonconsumptive RVDs are expected to remain CONSTANT; impacts to the Wind River Front. | Nonconsumptive RVDs are expected to increase by 2.5% per year over the study period as a result of increased protection for wildlife and fisheries resources. | Nonconsumptive RVDs are estimated to increase by 2% per year over the study period based on current trends. |
| **Consumptive** | | | | |
| **Fishing** | Fishing RVDs are expected to decline slightly by 1% per year as a result of increased impacts to rivers and streams from infrastructure construction. | Fishing RVDs are expected to decline by 2% per year as a result of increased development activities that would impact important habitat areas. | Fishing RVDs are expected to increase by 2.5% per year as a result of changes in vegetation management, protection of riparian areas, and protection of wildlife and fish resources. | Fishing RVDs are expected to increase by 2% to 5% per year based on current trends. |
| **Elk** | Elk hunting is expected to remain constant at the current 5-year average for the Pinedale Field Office. | Elk hunting is expected to decline by 2.5% per year during the study period as a result of expected declines in herd numbers resulting from increased mineral development, changes in vegetation management, and increased OHV use. | Elk hunting is expected to increase under this alternative as a result of changes in vegetation management, protection of riparian areas, and protection of wildlife habitat, resulting in an increase in RVDs by 0.5% per year. | Elk hunting is expected to remain constant at the current 5-year average for the Pinedale Field Office. |

| Use Type | Alternative 1 | Alternative 2 | Alternative 3 | Alternative 4 |
|---|---|---|---|---|
| **Antelope** | Antelope hunting is expected to remain constant at the current 5-year average for the Pinedale Field Office. | Antelope hunting is expected to decline by 2.5% per year during the study period as a result of expected declines in herd numbers attributed to increased mineral development, changes in vegetation management, and increased OHV use. | Antelope hunting opportunities are expected to increase under this alternative resulting in an increase in RVDs by 0.5% per year. | Antelope hunting is expected to remain constant at the current 5-year average for the Pinedale Field Office. Increasing somewhat. |
| **Mule and White Tail Deer** | Deer hunting is expected to continue to decline by 2% per year in the Pinedale Field Office, which follows recent trends. In addition, declines are expected as a result of increased occurrences of chronic wasting disease and loss of winter range availability. | Deer hunting is expected to decline by 3% per year during the study period resulting from impacts on wildlife from increased mineral development, changes in vegetation management, and increased OHV use. | Same as Alternative 1. | Same as Alternative 1. |
| **Moose and Big Horn Sheep** | Moose and Big Horn Sheep hunting are expected to remain constant at the current 5-year average for the Pinedale Field Office. | Same as Alternative 1. | Same as Alternative 1. | Same as Alternative 1. |

## Table A26-7. Summary of Visitor Expenditures

| Summary of Daily Visitor Expenditures | Per Person Per Day |
|---|---|
| Nonresident OHV Use | $130.27[a] |
| Nonresident Hunting | $127.18[b] |
| Nonresident Other Nonconsumptive Uses | $44.34[c] |

[a] *Hazen and Sawyer,* Economic Contribution of Off-Highway Vehicle Use in Colorado, Prepared for the Colorado Off-Highway Vehicle Coalition, *Denver, Colorado, July 2001.*

[b] *Morey & Associates, Inc.,* Report on the Economic Impact of the Travel Industry in Wyoming, 1998, *prepared for the Wyoming Business Council, Division of Tourism, Cheyenne, Wyoming, 1999.*

[c] *U.S. Fish & Wildlife Service,* 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, *Wyoming, FHW/01-WY Rev., 2003.*

## Table A26-8. Economic Assumptions for Recreation (Per Recreation Day)

| | OHV (2005$) | Other Nonconsumptive Uses | Hunting (2005$) |
|---|---|---|---|
| Direct Expenditures | $130.27 | $44.34 | $127.18 |
| Jobs Per RVD | 0.002716 | 0.000920 | 0.003687 |
| Earnings Per RVD | $42.26 | $13.21 | $51.76 |