THE WILDERNESS SOCIETY

ECOLOGY AND ECONOMICS RESEARCH DEPARTMENT

THE ECONOMIC & SOCIAL IMPACTS OF OIL AND GAS DEVELOPMENT

May 5, 2006

I. PURPOSE

This brief is submitted as part of the NEPA process for this public land oil and gas development proposal. It is intended to identify some of the issues that must be analyzed as part of the NEPA process and to offer methodologies to assist agencies responsible for analyzing the impacts of proposed land use decisions on Western communities and economies.

In making land use decisions, federal agencies have an obligation under the National Environmental Policy Act (NEPA) to take a "hard look" at the environmental consequences of a proposed action, and the requisite analysis "must be appropriate to the action in question." This brief presents issues to be analyzed, and data and methods for use in the analysis of the impact of oil and gas development proposals on the social and economic health of Western communities. Federal agencies, the public and communities cannot evaluate the consequences of proposed decisions or determine how best to avoid or mitigate negative impacts without adequate data and analysis. Through the examination of the issues and potential costs described below, federal agencies can better fulfill their obligations to evaluate the direct, indirect, and cumulative impacts of oil and gas development on the communities adjacent to Western public lands.

II. INTRODUCTION

As an agency prepares a management plan or an environmental impact statement for publicly owned lands, it must do a full and accurate accounting of the costs and benefits of each of the alternatives proposed, including both market and non-market values (Loomis, 1993). Historically, analyses by land management agencies of alternatives that emphasize resource extraction alternatives (oil and gas drilling, mining, timber) emphasized the benefits of extraction and ignored the costs. Failure to include all the costs of an oil and gas drilling proposal has two distorting influences on the decision making process. First, the alternatives that emphasize drilling appear more attractive than they actually are, and second, the opportunity costs of conservation-oriented alternatives will appear greater than they really are. Agency planners must provide a full accounting of the costs associated with extraction activities. Only when all the costs and benefits are fully accounted for can a truly informed assessment of the alternatives occur.

We have organized this paper to facilitate the identification of key issues related to oil and gas development on public lands, and the environmental, social, and economic impacts these decisions have on communities in the West. The first section discusses the need to examine economically recoverable resources, the need to correctly assess net impacts and benefits, and presents several potential impacts of oil and gas development that are either absent from, or incorrectly represented, in many federal agency's oil and gas leasing analyses. We also provide examples of specific analyses or methods for improving the analysis The next section presents our NEPA scoping comments which include specific costs and impacts that we feel must be analyzed in order to complete a thorough examination of land use plans. These analyses and methods provide a necessary, but not sufficient, analysis of the impacts of oil and gas leasing on public lands and the adjacent communities. We formally request that the agency incorporate these analyses and methods into its planning for, and analysis of, land allocation decisions that lead to oil and gas leasing and drilling proposals and at the project level implementation phase.

III. CHARACTERIZING OIL AND GAS DEVELOPMENT POTENTIAL

A. Estimating the Economically recoverable Volume of Oil and Gas

Recent research by economists at The Wilderness Society indicates that the federal government's assessments of the oil and gas resources on public lands are flawed and consistently over-estimate the energy potential (Morton, et al. 2002, The Wilderness Society 2004a and b). The oil and gas industry also has a history of exaggerating the amount of gas recoverable and exaggerating the cost of protecting the environment. Rose (2001) states, "Since 1993, most oil companies have acknowledged that their geotechnical staffs persistently overestimate prospect reserves, commonly by about 30% to 80%." Rose goes on to say, "...over optimism is not limited to certain companies -- it appears to be a chronic industry shortcoming that has proved to be difficult to correct." The inherent upward bias in industry estimates of energy potential should eliminate them for use by public land agencies. Shanley et al. (2004), veterans of the oil and gas industry, reinforce this point for public land in the Rockies:

"…it is likely that resource volumes are substantially overestimated, while the risks associated with finding and recovering those resources have most certainly been underestimated." As noted by LaTourrette, et al. (2002), economic constraints are, in most cases, the limiting factor on gas production in the Rocky Mountains, not environmental laws. The majority of undiscovered natural gas currently being proposed for exploitation in the Rocky Mountains are "unconventional" gases (continuous-type, tight sands gas, and coalbed methane). Economic recovery rates for unconventional oil and gas resources are lower than recovery rates for the conventional resources – reinforcing the need to base decisions on estimates of economically recoverable amounts of gas, not estimates of technically recoverable resources.

Technically recoverable oil and gas resources are the subset of the total resource base for which technology currently exists that makes extraction possible. This definition relies only on technological feasibility without regard to the cost of extraction or the prevailing prices. Economically recoverable oil and gas resources are the subset of technically recoverable resources that would be economic to produce. Analyses of the benefits of oil and gas development must be made based on accurate and appropriate estimates of the resources that are economically recoverable.

The Congressional Research Service (Corn, et al. 2001) and most, if not all, economists agree that the policy relevant opportunity cost of an environmental regulation is the economically recoverable amount of gas – not the technically recoverable amounts. It is inappropriate to base energy policy decisions solely on technically recoverable estimates. When economic criteria are considered, the estimates of oil and gas that are actually recoverable drop significantly from the initial estimates of technically recoverable resources (Attanasi 1998, LaTourrete et. al, 2002, 2003).

Exaggeration of the oil and gas resources by relying on technically recoverable estimates, distorts the analysis and increases risks to communities from false promises. For example, relying on estimates of technically recoverable resources will lead the agency to dramatically overestimate the number of new jobs that oil and gas drilling might create in a community. Basing decisions on technically recoverable estimates will exaggerate the potential tax revenues to the federal treasury, as well as state and local tax revenue. In addition, the potential spillover effects in the local economy from drilling will be exaggerated. Such exaggeration of the benefits of an oil and gas drilling project is an inappropriate distortion of the analysis of public land management alternatives and will lead to unrealistic expectations and possibly inappropriate support in local communities.

If economic factors are not considered, the opportunity costs of all forms of environmental protection will be overestimated. The agency will also likely overestimate the cost of lease stipulations, wilderness designation, and other protective measures if technically recoverable estimates are used. If the oil and/or gas are not economical to extract, there is no adverse impact on resource supplies from protecting wildlife, archeological sites, recreation sites and other public resources with leasing stipulations. Further, an EIS that relies on misleading economic information or fails to include all relevant costs in its economic analysis will violate NEPA, because it does not provide decision-makers and the public a valid realistic foundation on which to judge proposed projects.

The agency should not rely exclusively on a deterministic, single value estimate due to the high risk and uncertainty with such estimates. According to Rose (2001), “Single-value estimates…predict an outcome that is possible, usually optimistic, and nearly always wrong.” A better approach is to base estimates of gas and oil resources on a probabilistic range of values based on different levels of confidence. A probabilistic range of values more accurately portrays the risk and uncertainty inherent in industry estimates of undiscovered gas and oil resources. Reliance on a single value estimate does not comply with NEPA because it fails to use a range of values in order to fully consider the risk and uncertainty inherent on oil and gas estimates.

In addition to a range of probabilistic values, estimates of economically recoverable resources must be made based on a realistic range of resource prices in order to account for the uncertainty in forecasting future prices. Figure 1 shows historic prices for oil and gas in the U.S., and the potential volatility of these prices. To account for price uncertainty, USGS scientists use high and low price scenarios when estimating economically recoverable resources. We recommend a similar approach, including using USGS data for estimating undiscovered oil and gas resources

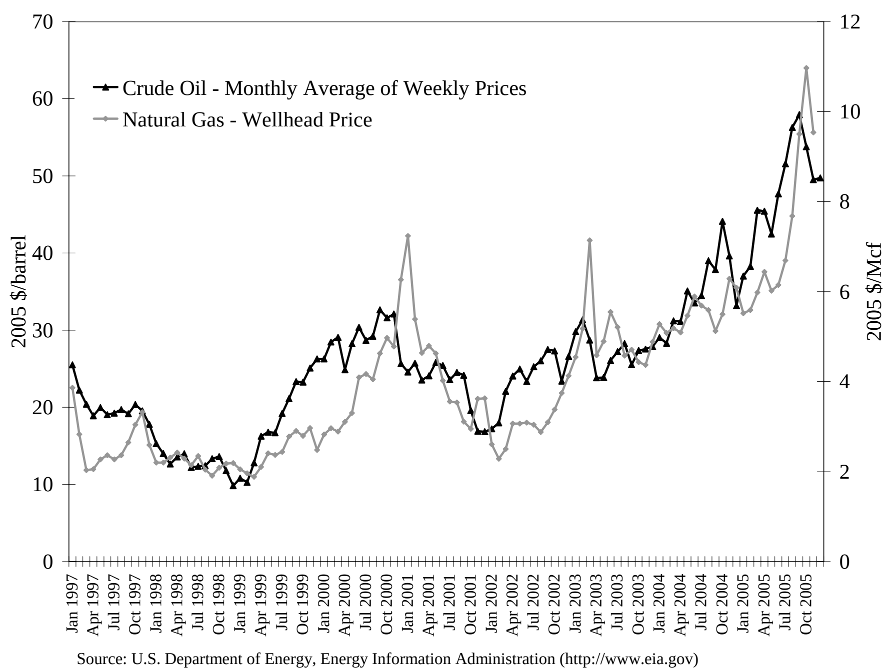


Figure 1. US Crude Oil and Natural Gas Prices

Many factors (flow rates, market price, drilling costs, etc.), not just environmental protection will influence whether resources are economic to produce, and economists make these assessments all the time. The price and costs assumptions used to estimate total production under each alternative must be critically examined and made clear. To be specific, when estimating the amount of gas recoverable, the price or price range that was assumed, and the costs of production that were assumed in the analysis, must be spelled out. If a company cannot get the gas out of the ground at a cost less than the assumed wellhead price, then the opportunity costs of protecting the environment are zero. This is just basic economics. To comply with NEPA, all analyses of impacts must be based on estimates of economically recoverable resources.

Please review the RAND Corporation reports (LaTourette, et. al 2002, and 2003; Vidas et. al, 2003) detailing methods to estimate economically recoverable resources and Attanasi (1998) which describes methods used by the US Geological Survey to estimate economically recoverable resources for all the basins analyzed in the Energy Planning and Conservation Act's (EPCA) 2002 Assessment.

NEPA requires a realistic assessment of economic impacts, and it is not realistic to assume that 100% of the technically recoverable oil and gas will ever be recovered The potential cost of protecting the environment and the possible benefits of drilling must all be based on estimates of economically recoverable resources. As the management plan and Reasonably Foreseeable Development scenario are developed, we formally request that they be based on economically recoverable amounts of oil and gas, not technically recoverable oil and gas.

B. Estimating the Employment and Income Benefits from Oil and Gas Development.

The IMPLAN model is an economic model often used by public land management agencies to project jobs and income from proposed actions. While the IMPLAN model can be useful as a tool to develop static analyses of the regional economy, communities must be aware of the shortcomings and poor track record of the model as a predictive tool.

In general, models like IMPLAN are grounded in economic base theory, which makes the incorrect assumption that an economy is static (i.e. it does not change). IMPLAN models do not consider the impacts of many important variables that affect regional growth in the rural West, such as amenities like high quality hunting, fishing and recreational opportunities, open space, scenic beauty, clean air and clean water, a sense of community, and our overall high quality of life. Many of these amenities are associated with attracting new migrants as well as retaining long-time residents. Many residents of Western communities (both long-time and new) earn retirement and investment income. As shown by an analysis of economic trends, retirement and investment income is becoming increasingly important to rural economies of the West. A recent letter from 100 economists (Whitelaw, et al. 2003) reinforces the importance of non-labor income to the economy of the West. While it is technically possible, most IMPLAN models completely fail to consider the important economic role of retirement and investment in the economy of a community or region. A more accurate, dynamic, and complimentary approach requires planners to examine regional trends in jobs and income.

Our more specific concerns have to do with the technical assumptions used in most IMPLAN models. These questionable assumptions include: no changes in relative prices, no input substitution or technological change in the production processes, no labor mobility, no change in products or tastes, no regional migration, and no changes in state and local tax laws. The assumption of no labor mobility is particularly important for oil and gas drilling proposals, since it draws into question the issue of local versus non-local job creation. Workers are mobile, especially in the oil and gas industry as crews move from drill site to drill site. There is no guarantee that the oil and gas jobs projected by IMPLAN will be filled by local workers. And in fact, workers in non-local crews fill most, if not all the direct jobs in oil and gas drilling.

Another major assumption used by IMPLAN is the constant technology assumption. Most IMPLAN models, by failing to consider the downward impact of technology on job growth, will exaggerate the job potential from oil and gas drilling. Industries attempting to maximize profits seek to reduce costs. Technological improvements reduce labor costs and result in fewer jobs. The downward trend in resource extraction jobs only becomes apparent if the agency completes a trend analysis of the change in jobs and income over time. With respect to oil and gas, the constant technology assumption contradicts the fact that technological change occurs in the oil and gas industry. Investments in technology have resulted in fewer and fewer workers required to drill each well, and has, over time, also reduced the number of workers required to produce natural gas and oil. The trends of technology replacing jobs in the oil and gas industry will continue. A review of government data confirms this: since 1987 output per worker in the oil and gas industry has been increasing (Figure 2).

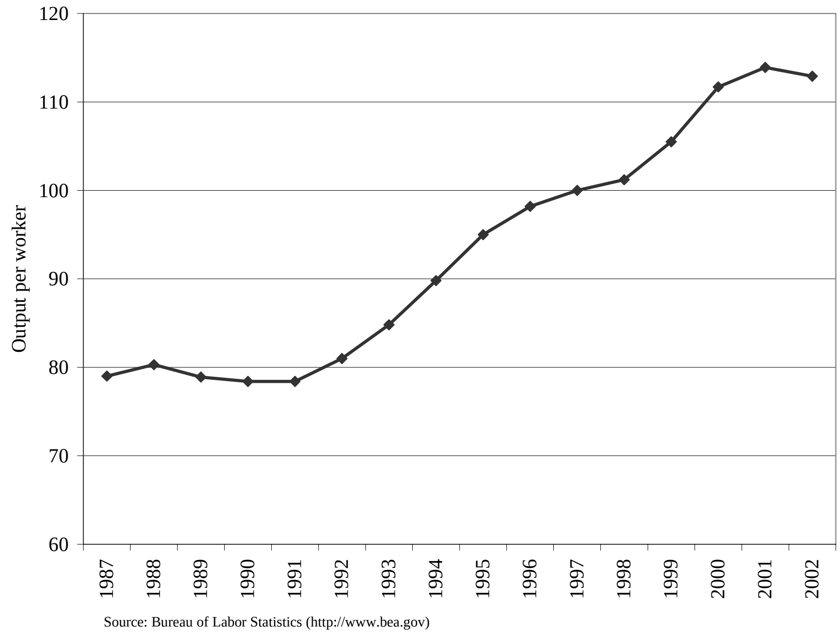


Figure 2. Labor Productivity in Oil and Gas Extraction

Laitner, et. al (1998) cite Bureau of Labor Statistics (BLS) data which indicate that in 1988, oil and gas drilling generated about 1.72 jobs per million dollars of spending. By 1998 that number fell to 1.44 jobs per million dollars. Further, BLS estimates that the number of oil-gas jobs will fall to 0.71 jobs per million dollars of spending by 2008. This indicates that the direct jobs estimated with a static model like IMPLAN model will be much more than the number actually created from drilling. As a result of this failure to account for technology improvements, input-output models are well known to predict higher multiplier effects than are actually experienced (Hoffman and Fortmann, 1996). As a result of holding technology constant IMPLAN will overestimate future job gains associated with an increase in drilling and production of gas and oil.

In a review of 23 studies that empirically tested the economic base hypothesis, Krikelas (1991) found only four studies that provided any evidence in support of economic base theory as a long run theory of economic growth -- a dismal track record. Despite dire predictions, history is replete with cases of communities and areas that lost their export base and continued as successful economies with their social capital intact. The local-serving sectors of the economy were the persistent ones, as new exports were substituted for the old. Tiebout (1956) recognized the shortcomings of the economic base theory when he wrote, "Without the ability to develop residentiary activities, the cost of development of export activities will be prohibitive." Krikelas (1992) concludes that economic base theory has severe limitations, especially for economic planning and policy analysis. This is a conclusion that community leaders and land management officials and planners can no longer ignore, and one that should be incorporated into public land and community-level planning. As Haynes and Horne (1997) note:

> Where the economic base approach gets into trouble is when it is **used inappropriately as a tool for planning or predicting impacts** of greater than one year in duration; a snapshot of current conditions tells little about the form a region's future economy may take (emphasis added) p. 1812.

Economists with both the Forest Service (Hoekstra, et. al 1990) and the Office of Technology Assessment (1992) concluded that while IMPLAN is useful for appraising the economic impacts of a management plan, the model is insufficient for evaluating the overall economic impacts for communities.

And according to the OTA (1992), IMPLAN has an additional shortcoming for assessing community impacts: the economic data used to construct IMPLAN do not provide comparable details for all resource-based sectors of the economy. While economic data for oil and gas is classified as a separate manufacturing industry, recreation is scattered among a variety of industries generally classified in services and retail, with some in transportation. The ease of data acquisition for estimating oil and gas impacts combined with the difficulty of estimating the impacts of recreation and tourism underscores the potential bias favoring oil and gas development in IMPLAN modeling.

The 25th anniversary issue of the Journal of Regional Science includes an article by H.W. Richardson, a noted regional scientist, who believed that 40 years of research on economic base models "has done nothing to increase confidence in them." In addition, he concluded that it would be hard to "resist the conclusion that economic base models should be buried, and without prospects for resurrection" (Richardson, 1985). He is not alone. Many have suggested that economic base theories be abandoned in favor of other, more comprehensive theories of regional growth and development (Krikelas, 1992; Rasker, 1994; Power, 1995 and 1996). Many of these economists recommend analysis of regional trends in total personal income as a better way to understand where the local economy came from and where it is headed.

The concern over the accuracy of models like IMPLAN combined with concern over the use of these models for planning, suggests that it is not only inappropriate but a disservice to rural communities to rely on IMPLAN to estimate the economic impacts of public land management alternatives on rural communities. We recommend that the agency stop relying on IMPLAN and other models derived from economic base theory. We insist that the agency fully discuss the assumptions, the shortcomings, and the risk and uncertainty due to the poor track record of the IMPLAN model in planning efforts. We also request that all data and multipliers used to project local impacts be made public. If planners use IMPLAN, the model must account for non-labor income, as well as income from hunting, fishing, and recreation. If the agency uses IMPLAN, it must also account for the fact that most drilling is completed by non-local crews. If the agency uses IMPLAN, the analysis must account for increasing labor productivity and hence declining jobs per well drilled.

At the same time the agency must also complete a trend analysis of regional jobs and income – to provide a better and more complete understanding of their economic past and their economic future. We formally request and recommend that the agency analyze economic trends using the Economic Profile System model developed by the Sonoran Institute in cooperation with the Bureau of Land Management (available at http://www.sonoran.org).

C. Estimating Gross and Net Revenues from Oil and Gas Production

Oil and gas production results in revenues flowing to federal, state and local governments. To help make better informed decisions, the revenues must be estimated accurately and with full consideration of declining production curves and tax laws. Oil and gas revenues, by themselves, only represent flows of **gross** revenue – while **net** revenue is the policy relevant metric that must be analyzed. In order to estimate the **net** revenues from oil and gas production, the associated costs must be fully accounted for in the analysis (see next section). The costs to local communities from drilling are real and have already been demonstrated to be significant (Western Organization of Resource Councils 1999, Darin 2000, Pedersen Planning Consultants 2001, Pinedale Anticline Working Group, 2005), must be accounted for in the analysis of net revenues from gas production.

As conventional oil and gas fields are developed, production is initially high, before gradually decreasing over time. Production is not linear. This declining production curve for gas and oil wells must be taken into account when estimating tax revenues based on the value of produced resources. In the case of conventional wells this means that communities might enjoy large initial revenues that will decline in later years. The decline in revenues leaves communities with a lower stream of income to deal with the oil and gas cleanup and remediation costs, which are likely to increase over time.

In contrast with production from conventional gas, production of coalbed methane (an unconventional gas) is initially slow due to the "dewatering" phase that may last several years before production can begin. In coalbed methane areas local communities are more likely experience significant increases in the costs to local governments early on without the benefit of corresponding increases in local tax revenues.

Revenue estimates must also account for variations and exceptions in local tax structures rather than simply estimating the value of the total resource and multiplying by the current or average tax rate. For example, Montana's tax structure encourages exploration and development by taxing the first year of production at a lower rate. In Colorado, producers are able to deduct any local property taxes and ad valorem severances taxes paid from their state severance taxes. Other policies which may reduce overall revenues are lower tax rates for directional drilling and for wells that are considered "marginal" (that is, producing below some minimum daily amount). These exceptions and reductions in the actual taxes paid need to be accounted for and included in the analysis of potential public revenue estimates for oil and gas drilling proposals.

We requests that the agency determine all applicable Federal, state and local tax laws (including exceptions and reductions) and that these laws and regulations be used to make realistic and accurate estimates of net tax revenues from oil and gas production. As discussed above, revenue estimates must be made based on economically recoverable resources rather than technically recoverable – and must include the environmental and community costs from drilling and production.

D. Include a full accounting of the hidden economist costs from oil and gas extraction

As discussed, oil and gas revenues, by themselves, only represent flows of **gross** revenue – while **net** revenue is the policy relevant metric that must be analyzed. In order to estimate the **net** revenues from oil and gas production, the associated costs must be fully accounted for in the analysis. Similarly, oil and gas jobs by themselves, represent gross jobs. In order to estimate the net jobs associated with an alternative, the job losses associated with drilling must be accounted for.

In addition to market costs, economic analyses of recoverable gas must include a full accounting of non-market costs. Because they exclude non-market costs, USGS estimates are just the starting point to determine whether undiscovered gas is economically viable to extract. After 35 years of research by academic and federal agency economists (Krutilla 1967, Krutilla and Fisher 1985, Peterson and Sorg 1987, Loomis and Richardson 2001), it is now possible to quantify non-market environmental costs that arise from development of natural resources (see Table 1). The BLM and the Forest Service should include a full accounting of non-market costs in the effects analysis required by the National Environmental Policy Act (NEPA) for leasing and drilling decisions (Morton et al. 2004). To assist the agency with this task, we have included in the table various methods for estimating these costs

Table 1. Economic Costs of Mining and Oil and Gas Extraction

Cost Category	Description of Potential Cost	Methods for Estimating Cost
Direct use	Decline in quality of recreation including hunting, fishing, hiking, biking, horseback riding. Loss of productive land for grazing and farming	Travel cost method, contingent valuation surveys.

Table 1. Economic Costs of Mining and Oil and Gas Extraction

Cost Category	Description of Potential Cost	Methods for Estimating Cost
Community	Air, water and noise pollution negatively impacts quality of life for area residents with potential decline in the number of retirees and households with non-labor income, loss of an educated workforce, and negative impacts on non-recreation businesses. Decline in recreation visits and return visits negatively impacts recreation businesses. Socio-economic costs of boom and bust cycles.	Surveys of residents and businesses. Averting expenditure methods for estimating the costs of mitigating health and noise impacts. Change in recreation visitation, expenditures and business income. Documented migration patterns.
Science	Oil and gas extraction in roadless areas reduces the value of the area for study of natural ecosystems and as an experimental control for adaptive ecosystem management.	Change in management costs, loss of information from natural studies foregone.
Off-site	Air, water and noise pollution affect quality of life for local residents, and decreases quality of recreation experiences for downstream and downwindvisitors. Haze and drilling rigs in viewsheds reduce the quality of scenic landscapes, driving for pleasure, and other recreation activities and negatively impacts adjacent property values. Groundwater discharged can negatively impact adjacent habitat, property, and crop yields, while depleting aquifers and wells.	Contingent valuation surveys, hedonic pricing analysis of property values, preventative expenditures, well replacement costs, restoration and environmental mitigation costs, direct impact analysis of the change in crop yields and revenues.
Biodiversity	Air, water and noise pollution can negatively impact fish and wildlife species. Ground water discharge changes hydrological regimes with negative impacts on riparian areas and species. Road and drill site construction displaces wildlife and fragments wildlife habitat.	Replacement costs, restoration and environmental mitigation costs.
Ecosystem services	Discharging ground water negatively impacts aquifer recharge and wetland filtration services. Road and drill site construction increase erosion causing a decline in watershed protection services.	Change in productivity, replacement costs, increased water treatment costs for cities, preventative expenditures.
Passive use	Roads, drilling and pipelines in roadless areas results in the decline in passive use benefits for natural environments.	Contingent valuation surveys, opportunity costs of not utilizing future information about the health, safety, and environmental impacts of oil and gas drilling.

E. Estimating the Socio-economic Costs to Communities from Oil and Gas Development

1. Increased costs to private land owners and residents

The current oil and gas boom has generated significant costs to communities in the West. One such area is Wyoming's Powder River Basin, the site of massive coalbed methane development. While this development has increased the fortunes of some, others are not faring as well (Pederson Planning Consultants 2001). Landowners in the Powder River Basin are spending thousands of dollars on attorneys in order to attempt to protect their property, often to no avail, as these areas have seen dramatic declines in property values. Other areas are also experiencing declines in private property values as the result of the accelerated oil and gas development. A recent study in La Plata County Colorado found that coalbed methane wells resulted in property value decline of 22 percent (BBC Research and Consulting 2001).

Resident's quality of life also suffers during accelerated oil and gas development. These costs must be accounted for in the analysis. In a survey of residents of Sublette County, Wyoming (one of the communities currently experiencing accelerated oil and gas development, McLeod et al. (1998) found that when asked why people chose to live in the area, most cited the scenery, recreation, lifestyle, and clean air and water over economic factors such as jobs or low taxes. All of these amenities are diminish when oil and gas drilling increases in scale. The loss of amenities and the economic impacts of the loss of amenities must be acknowledged and accounted for in the analysis.

We formally request that the agency estimate the costs associated with oil and gas development to private landowners as part of the NEPA process.

2. Increased costs to local governments

Accelerated oil and gas development is often touted as a fiscal savior for struggling Western communities. However, the potential windfall is not without costs (Morton, et al. 2002). These include added strain on infrastructure, increased road maintenance costs, increased demand for public services such as hospitals and schools, increased need for emergency services (due both to increased population and an increase in the number of people working in more dangerous occupations such as those found in the oil and gas extraction field), and a host of less tangible costs due to the effects of a changing demographic and social makeup of the towns and communities. These added costs due to rapid increases in oil and gas drilling are being experienced by the communities in the Pinedale Anticline area of Wyoming (Pinedale Anticline Working Group 2005).

The Pinedale area has experienced increases in emergency calls and ambulance service requests in the years since oil and gas drilling has accelerated. Emergency calls more than doubled between 2000 and 2003, while ambulance runs increased by 36%. Traffic and automobile accidents have also increased in conjunction with oil and gas drilling. One major intersection in Sublette County saw traffic rates nearly triple between 1995 and 2003. After declining in the mid 1990's, accident rates per capita increased 23% between 1999 and 2003, and this increase mirrors the increase in drilling rigs in the area (Pinedale Anticline Working Group, 2005).

Costs to boomtowns in the West include an increase in truck traffic resulting in increased road maintenance costs (Pinedale Anticline Working Group 2005, Craig Daily Press 2004, 2005). Increased traffic also results in dust from poorly constructed access roads which causes health problems for both humans and livestock, reduces the grass available for cattle, and negatively impacts air quality and visibility.

Crime and other social problems intensify in boomtowns, with these areas seeing increases in larceny, traffic violations and accidents, destruction of private property, family violence, and child abuse. Oil and gas workers facing long shifts and time away from families often turn to drugs (High Country News 2005). All of these escalating problems increase the cost of emergency and social services for cities and counties. Boomtowns often experience a shift in the labor force. Workers leave for oil and gas jobs, resulting in instability in the labor force and difficulty hiring public workers (e.g. policemen, firemen) at a time where the counties and cities are stretched thin to handle the increased workload (Pederson Planning Consultants 2001).

Gulliford (1989) examined the consequences of the boom and bust nature of oil and gas development. He chronicles the fortunes of Garfield County, Colorado before, during, and after the push to extract oil from oil shale in the late 1970's. Oil shale production proved to be uneconomical even at high prices. The companies who had planned to exploit the resources encouraged the communities in the area to make large investments in infrastructure to accommodate workers for the oil shale boom, and then abandoned them before any oil was produced, leaving overbuilt towns with large debt burdens. Before leaving the county however, the oil shale boom also resulted in an increase in social problems related to rapid population growth and the prospect of easy money.

Accelerated oil and gas development has left many counties and communities unable to pay for or finance the increase in public service costs or the cleanup cost after the bust. We have every reason to believe that similar costs and burdens will be placed on other communities where public and private land is threatened by oil and gas drilling. <u>When estimating the benefits of an oil and gas development project the agency must show these benefits as net rather than gross. The increased public service and infrastructure costs associated with expedited oil and gas development must be fully accounted for as part of the NEPA process for the current push to develop oil and gas in the West.</u>

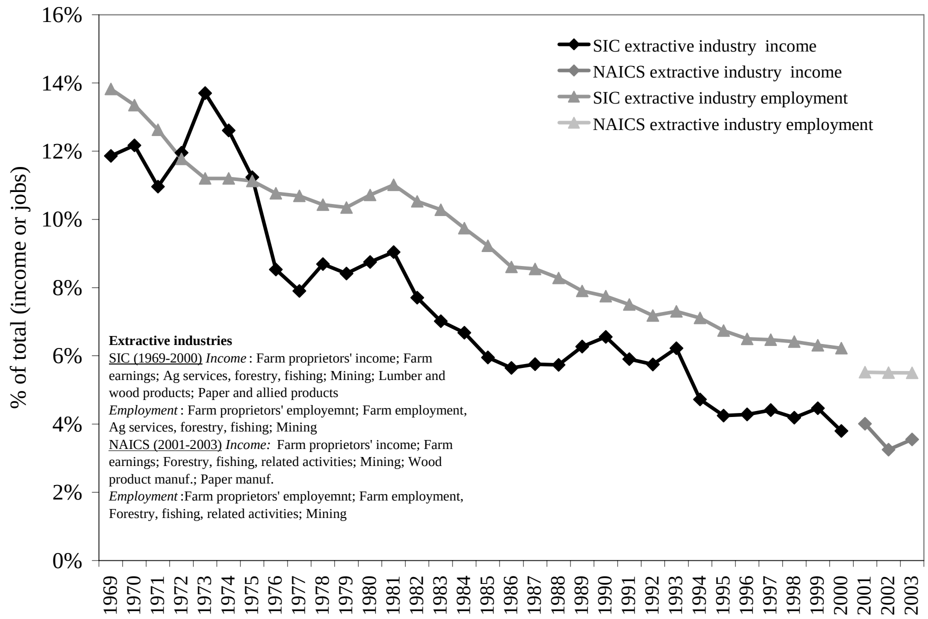
3. Economic instability and a loss of economic diversity

The agency should analyze and discuss the socio-economic costs associated with an historic emphasis on resource extraction industries, which has resulted in repetitious cycles of socio-economic distress for rural communities. When a county or area is dependent upon only one or a few industries for most of its employment and income there are often negative consequences, mostly stemming from fluctuations in the dominant industries. Limerick et al. (2002) describe Western resource-dependent communities this way:

> "In many towns, communities, settlements, and sub-regions of the West, everyone's fortune depended on the production and marketing of one commodity. Dependence on one commodity brought a particular kind of precariousness, instability, and vulnerability to external changes, whether of markets or climate. Farm towns, mining towns, cattle towns, and logging towns had no insulation from any problems that might strike the industries on which they relied." (page 1)

Research has indicated that an emphasis on resource extraction results in communities with an inherent economic instability associated with them. This instability, in income and employment, for example, is a result of labor saving technological improvements and fluctuations in world resource markets -- macroeconomic forces completely outside local control. Fluctuations in jobs and income in the extractive industries illustrate the economic instability and lack of local control associated with promoting rapid oil and gas development. Communities have little control over the local economy because they have absolutely no control over global commodity prices. When prices drop, companies abandon wells, lay off workers, and leave the communities high and dry to suffer the economic and environmental consequences.

The extractive industries, including oil and gas development, despite the current boom represent an ever smaller portion of the total jobs and income in the Rocky Mountain West (see Figure 3). The relative importance of these industries compared to expanding industries in the professional and service sectors, and those which depend on non-labor income must be acknowledged in the NEPA and planning process for public land management



Source: US Department of Commerce, Bureau of Economic Analysis (http://www.bea.doc.gov)
Note: The figure is based on SIC data for 1969-2000 and NAICS data for 2001-2003 in order to show the long-term trend. While not explicitly compatible, the two classification systems show similar trends for extractive industry income and employment and illustrate the general downward trend, even during the current oil and gas drilling boom in the Rockies.

Figure 3. Extractive Industry Income and Employment in the Rocky Mountain Region

Several studies have examined the problem of poverty in rural areas which are dependent on the extraction of only one or a few natural resources for most of their economic activity. As Freudenburg and Gramling (1994) point out, “At the regional level, the highest levels of long-term poverty in the United States… tend to be found in the very places that were once the sites of thriving extractive industries…" They point out that the problem of poverty in these resource-dependent regions is not limited to the times of lower or zero production, but also occurs during the active operations of the extractive industry. Resource extractive workers find themselves in a vicious cycle of relatively high paying jobs with frequent layoffs and unemployment. This cycle is what Freudenburg (1992) calls the "intermittent positive reinforcement regime." While resource extractive workers develop high skills, such skills are not readily transferable to other jobs, and the workers become overspecialized (Freudenburg and Gramling, 1994). These areas attract resource extraction industries, often to the exclusion of other industries. Investment in education and job retraining is low because "the potential return on their investment in their education is either too low or too uncertain to justify sacrifice” (Humphrey et al. 1993). The resultant pattern of "rational under-investment" in the development of skills and other forms of human capital can result in reduced economic competitiveness in resource-dependent communities.

Economic instability is of concern to community leaders because if a local economy is unstable, economic development plans are more likely to fail. The economic instability created in the "boom and bust" economies associated with resource extraction increases the risk for capital investment in linked industries. As such, resource specialization and the resulting economic instability can prevent the formation of forward and backward economic linkages in the local and regional economy. After examining the less desirable aspects of the wood products industry Fortmann et al. (1989) concluded:

> Disincentives for stable employment, preferences for younger and cheaper labor that leave the less mobile and less trainable older worker out of work, cycles of market activity that carry with them high rates of unemployment, injury and illness rates and fatality rates that top all other employment categories are not attributes of a stabilizing industry, no matter how stability is defined.

Similar socio-economic trends are associated with the oil and gas industry. Smith (1986) examined the boom and bust phenomenon in the specific context of oil and gas extraction. He points out that high prices for oil in the late 1970's led to an increase in drilling, but there was no corresponding increase in production during the same period. He speculates about the reason for this: "Drilling in some states may have been extended into marginal areas under very optimistic price expectations, and such operations had to be abandoned when prices were no longer adequate." These sorts of activities lead to the classic boom and bust economic cycle typical of many rural resource-dependent areas. "Those states that showed the largest rate of growth in oil and gas extraction during 1972-81 tended to have the largest rate of decline in the post 1981 period." There is every reason to expect that the current boom will eventually lead to a similar bust. See also Goldsmith (1992) and Guilliford (1989) for further research examining the socio-economic costs to communities associated with an economy focused on oil and gas drilling.

Continued emphasis on export activities, if left unchallenged, will only insure future cycles of socio-economic distress in rural communities in the West, especially in isolated Western communities The impacts on local economic diversity, the socio-economic risks to communities from cycles of boom and bust, as well as the economic instability associated with oil and gas development, must be analyzed and addressed as part of the NEPA process.

F. Estimate and Evaluate the Environmental Costs of Oil and Gas Development

The environmental costs of drilling include erosion, loss of wildlife and fish habitat, declines in the quality of recreational opportunities, proliferation of noxious weeds, and increased air and water pollution. These costs increase with the scale and speed of oil and gas operations. Environmental impacts can be mitigated with the implementation and enforcement of lease stipulations and monitoring of impacts throughout the project's life. Proper monitoring of the environmental impacts of oil and gas and other development programs require that accurate and complete data be collected and used.

1. Water Impacts

One of the major environmental costs associated with oil and gas drilling is increased water pollution. Oil and gas drilling will have impacts on the amount of water available for other uses and the displacement of large volumes of water - *quantity* impacts, as well as *quality* impacts resulting from the discharge of pollutants and from the increased levels of pollutants resulting indirectly from quantity changes.

a) Water quantity impacts

Accelerated drilling activity for coalbed methane is having profound real life impacts on many families and communities in the West. In order to release the natural gas from coal beds, enormous amounts of ground water must be pumped from coal aquifers to the surface. The water discharged on the surface comes from shallow and deep aquifers often containing saline-sodic water. The amount of water produced from individual coalbed methane wells is generally much higher than that from other types of oil and gas wells (USGS, 1995). Coalbed methane wells in Wyoming and Colorado discharge between 20,000 to 40,000 gallons per day per well (Darin, 2000). The disposal of the produced water not only affects the economics of development, but also poses serious environmental concerns.

The total amount of water discharged from CBM wells in Wyoming alone has skyrocketed in recent years, increasing from approximately 43.5 million gallons (134 acre feet) in 1990, to 18 billion gallons (56,000 acre feet) in 2005 (Wyoming Oil and Gas Conservation Commission, 2006). The discharging of 56,000 acre feet of water in the arid West is wasteful in the short-term (generally an acre-foot of water will supply a family of four for one year), and has potentially devastating economic impacts for affected communities in the long-term. Dewatering of deep aquifers may upset the hydrologic balance, eliminating or reducing the availability of this water for future agricultural and domestic uses, and impacting the recharge of shallow aquifers and surface water.

The discharge of ground water can deplete freshwater aquifers, lower the water table, and dry up the drinking and irrigation water wells of homeowners and agricultural users. The short-term economic costs include drilling new wells for current and future landowners, when successful wells can be found, and the costs of acquiring new water sources when they cannot. If the freshwater aquifers do not fully re-charge, the long-term economic costs to affected landowners, homeowners, communities, and states across the West could be severe, including the foregone opportunity (option value) to use aquifer water in the future. The expected costs of these damages must be accounted for in the analysis.

The discharge of tens of thousands of gallons of ground water transforms many streams that normally flow intermittently (only during spring runoff or after storms) into all-season streams. The influx of water has resulted in deep channel scouring, erosion, and increased sedimentation. Increased sedimentation in streams can negatively impact native fisheries. This in turn increases the financial costs for fishery restoration projects. The altered water flows from surface discharge of produced water will negatively impact thermal and flow regimes, and likely contribute to bank erosion and changes in riparian vegetation (Allan, 2002). Gore (2002) warned that the loss of habitat caused by increased water flows from discharged water at coalbed methane projects could eliminate up to 30 aquatic species within 20 years.

The discharge of water into intermittent stream channels damages native flora and fauna not adapted to year-round water and promotes the spread of noxious weeds such as Scotch burr and Canadian thistle. The change in native vegetation composition, combined with the increase in noxious weeds, negatively impacts threatened and endangered species and other wildlife, as well as cattle. The loss of native species and the spread of noxious weeds across the West has enormous economic costs to both public and private interests.

The landscape is also impacted from the retaining ponds or reservoirs constructed to store the water discharged from the drilling operation. The constructed earthen dams and retaining ponds destroy additional habitat and introduce artificial structures to the landscape. Habitat and homes on property near these reservoirs also have potential risk of flooding from structural failure of the poorly designed, quickly built retaining ponds.

When proposing oil and gas development, the agency must fully examine and account for the risks and costs associated with water depletion, loss of native fisheries and fisheries restoration, the additional costs of noxious weed mitigation, and the costs associated with the building and potential failure of artificial water retention structures.

b) Water quality impacts

Trout Unlimited recently published a literature review of the impacts of oil and gas development and exploration on coldwater fisheries (Trout Unlimited, 2004). The findings of the report conclude that many of the studies reviewed “point towards confirmed deleterious effects caused by gas and oil exploration and development.” One study found that the allowable discharge level in most states were far too high, 400 times that recommended by the EPA, and produced significant physical and toxic effects on trout in Wyoming. While also pointing out the need for further studies, the Trout Unlimited study supports the conclusion that oil and gas development results in substantial negative effects on water and the wildlife that depends on it for survival.

The water discharged from oil and gas wells can be highly saline with a very high sodium absorption ratio (SAR) – a ratio that affects how water interacts with soil. Water with a high SAR can permanently change chemical composition of soils, reducing soil, air, and water permeability and thereby decreasing productivity of both native plants and irrigated crops.

Oil and gas drilling and production can also lead to increased sedimentation of water bodies, which in turn is harmful to aquatic species. According to Clement (2002), referring to proposed coalbed methane development in the Powder River Basin:

> "Increased sedimentation resulting from erosion of stream banks, overland flow, and road construction will likely impact aquatic organisms… Input of sediments to aquatic ecosystems is widely regarded as a major source of stream degradation in North America."

And finally, drilling for oil involves ecological risks and potential economic costs associated with blowouts -- the catastrophic surge of the highly pressurized fluid from the drill hole that can cause fires, loss of life and property, and the potential contamination of surface drinking water sources. To reduce the number of blowouts, rotary drilling operations typically inject a fluid of drilling muds into the drill hole in order to lubricate and cool the drill bit. While reducing the number of blowouts, the drilling fluids themselves create a risk of contamination of adjacent freshwater aquifers (Gauthier-Warinner, 2000). Recently, the New Mexico Oil Conservation Division (OCD) compiled and posted on its website information regarding groundwater impacts from leaks, spills and releases resulting from oil and gas operations, although this data does not include all such impacts or all sources associated with oil and gas development and operations. There are close to 1400 groundwater contamination instances in the OCD's database that are attributed to oil and gas activities.

<u>We formally request that all the impacts on and risks to water quality from oil and gas be fully analyzed and the costs of these impacts included in the NEPA analysis for oil and gas development.</u>

2. Oil and Gas Footprint

Oil and gas drilling operations leave behind a large footprint on the landscape – a footprint that extends well beyond the several-acre drilling sites. Beginning with exploratory activities, large trucks with seismic surveying equipment crisscross the landscape using a crude system of roads. These roads are made to the lowest standards possible in order to minimize the financial costs of gathering geophysical information, with little consideration for wetlands, fragile soils, storm water runoff or critical habitat. Exploratory drilling operations then require more large trucks with drill rigs using a network of constructed roads to access drill sites. If the exploratory well is determined to have no potential for production, the well is plugged, but the landscape scars remain. If producible resources are found, more wells, along with the attendant roads and pipelines will follow. Depending on the agency with oversight, there is typically little enforcement or monitoring of environmental regulations. In addition, no surety bonds are required for restoration or clean up. <u>All of these factors create footprint that extends beyond the drill-pad and the costs associated with extended zone of impacts this must be accounted for in agency analyses of oil and gas development.</u>

a) Well spacing and actual well numbers

States usually have general rules setting default minimum spacing requirements between producing wells. They are set to establish the maximum area of an oil or gas deposit that can be efficiently drained with one well. In most cases the operator can petition for a reduction in well spacing if they can show that such spacing changes will result in more efficient production. Well spacing limits apply to each formation, meaning that if formations overlap, more well pads may be established on the surface than might be indicated by the stated spacing limits. The spacing limits do not include dry holes, only producing wells.

When a well is drilled it is unknown whether it will eventually produce oil or gas, or whether it will be a dry hole. If the well has potential for production, the well is cased with pipe and cemented (in an attempt to prevent oil and gas from seeping into nearby aquifers), and the drilling rig is replaced by a well head. Electric or gas powered motors are used to power the pumps that collect the gas at each well and to power the series of compressor stations that pressurize gas for pipeline transport from the wells to customers in distant markets (WORC, 1999). These compressors run 24-hours a day. Furthermore, additional wells are usually drilling in the immediate vicinity when a producing well is discovered. All of these activities create a cumulative impact on wildlife habitat, air quality, water quality, and noise levels that goes beyond the immediate footprint of development.

Many drill sites also involve the construction of sediment ponds and retention reservoirs to collect storm water drainage and store the ground water brought to the surface as a result of the drilling and extraction operation – the latter process is called dewatering. Injection wells are sometimes used to dispose of the water produced and to enhance oil and gas recovery – an action that may necessitate additional drilling of up to hundreds of injection wells throughout the field (Gauthier-Warinner 2000). The ecological footprint not only extends across the landscape, it also penetrates to shallow aquifers as well as aquifers thousands of feet below the earth's surface.

Exploiting the gas in unconventional, tight sands deposits will require drilling a significant number of wells, as the distribution of these resources is not well understood. Extracting this tight sands gas may require 5 or 10 acre spacing, such as is proposed in the Jonah field in Wyoming. As noted by the USGS (1996), **"land-use planners are not in a good position to determine the societal impacts of the drilling (density) that would be necessary if these continuous reservoirs of (tight) gas were exploited."** (emphasis added).

In order to estimate the full extent of surface disturbance, the agency must correctly account for potential decreases in spacing limits, success rates for both exploratory and development wells, and estimate the cumulative environmental and economic impact of all wells drilled and all well pads established on the surface. The agency must fully examine the environmental impacts from the footprint associated with oil and gas development and include the pipelines, roads, and other oil and gas infrastructure and the impacts on the landscape from this development.

<u>We formally request that the agency provide an accurate estimate of the numbers of producing wells, dry holes, and injection wells, and that the cumulative impacts of all wells and associated roads, pipelines and other infrastructure be analyzed fully as part of the NEPA process.</u>

b) Pace of development

The pace at which an oil or gas field is developed will influence the extent of the oil and gas footprint. When drilling is phased to take place over a longer period of time, the impact of concurrent drilling operations can be lessened, and dry holes and wells that stop producing can be reclaimed before beginning new well drilling. When drilling is pushed through in a short period of time the total area impacted is much larger. Rapid development also intensifies the socio-economic impacts which accompany drilling. More wells being drilled at once mean more workers moving into an area at the same time. If development is staged the community will be better able to absorb them, reducing the need for accelerated infrastructure upgrades. Phased development may also prevent the rapid economic swings associated with the boom and bust cycle typical of the oil and gas industry.

<u>We formally request that the agency require phased development of oil and gas resources on public lands, and that the costs associated with rapid versus phased development be fully analyzed and compared as part of the NEPA process.</u>

c) Impacts on wildlife

The impacts of oil and gas development extend beyond the footprint of development (Trombulak and Frissell 2000, Lyon and Christensen 2002, Lutz et al. 2003, WGFD 2004, Sawyer 2005). It is insufficient to simply indicate the percentage of the planning area that will be impacted by drilling. The analysis must estimate the percentage of critical wildlife habitat that will be directly and indirectly impacted. These estimates must include measures of the direct fragmentation of wildlife habitat, the indirect impacts, and not just the footprint. In addition to their direct effects (such as immediate landscape disturbance and habitat fragmentation), motorized routes also have negative impacts on wildlife such as noise, dust, air pollution, water pollution, erosion, and human presence that extend beyond the immediately disturbed area. Road densities as low as one percent or less of a given landscape can impact more than 99 percent of that landscape, leaving little undisturbed area in which wildlife can thrive. (Weller, et al., 2002; Hartley, et. al, 2003, Thomson, et. al, 2004; Thomson, et al., 2005).

Lease stipulations help protect wildlife but only if they are required and enforced, and data from the Bureau of Land Management and other sources indicate that they are not (GAO 2005). In the Rocky Mountain West, where hunting, fishing, and wildlife viewing generated $5.9 billion in revenue in 2001 (U.S. FWS and U.S. Census Bureau 2001). Drilling (and its direct impacts on wildlife and their habitat) has hidden economic costs in terms of lost revenues from license fees, equipment sales, and other related purchases. See Morton et al. (2002), Weller, et al,(2002), Hartley, et. a,(2003), Morton et al. (2004), Thomson, et. al, (2004,) and Thomson, et al (2005).

Wildlife habitat fragmentation results in both market and non-market costs. These costs must be analyzed as part of the NEPA process for oil and gas development.

d) Pipelines

In order to bring gas to market, thousands of miles of pipeline must be constructed – extending the impacts of gas drilling far from the actual drill site. There are currently more than 270,000 miles of gas transmission pipelines and another 952,000 miles of gas distribution lines. The cumulative costs and environmental impacts associated with pipeline construction must be included in the agency analysis – because drilling wells and building pipelines are connected actions. The environmental costs associated with construction, maintenance, and repair of pipelines, as well as the costs of the habitat fragmentation due to pipelines must be examined as part of the NEPA process for and oil and gas development.

e) Roads

Oil and gas exploration also requires roads which increase ecological costs and invite cross-country travel and subsequent habitat damage. Oil and gas drilling and production often require daily vehicular trips to monitor and maintain wells and pipelines. The increased traffic disrupts wildlife, may result in more road kill, and diminishes quality of life for local residents. The linear deforestation associated with road construction degrades habitat and fragments travel corridors needed by wildlife species. Roads become conduits for non-native species that displace native species resulting in significant mitigation costs for taxpayers.

Proliferation of roads increases ORV use and thus the costs of the ecological and habitat damage associated with motorized recreation. Increased access and use by ORV-riders leads to increased ORV monitoring costs. Roads, by providing access, may increase the frequency of human-caused fires. Humans caused sixty percent of all wildfires in the Rocky Mountains between 2001 and 2005 (National Interagency Fire Center, 2006). Furthermore, Forest Service statistics show that eighty-six percent of human-caused fires occurred in roaded areas (USDA Forest Service, 2000). Roads increase the damage to historical, cultural and archeological resources due to increased ease of access. Roads increase sediment deposits in streams resulting in reductions in fish habitat productivity. Roadless areas protect communities from sedimentation of water supplies and catastrophic events such as landslides.

The agency also needs to analyze the costs of road maintenance and restoration and compare these costs with the budgets available to complete the work. Each new mile of road added to the public lands transportation system competes for limited road maintenance funding. The Forest Service has a 10 billion dollar backlog of road maintenance projects and additional roads on public lands will only increase this backlog unless adequate funding is assured (Taxpayers for Common Sense, 2004).

The costs associated with ecological damage due to oil and gas roads must be included in the analysis of plan alternatives involving oil and gas drilling and oil and gas projects. The agency must also include a detailed analysis of the costs associated with monitoring increased road mileage as part of the NEPA analysis. And finally, the costs for road maintenance must be accounted for in the NEPA process.

G. Correctly Account for Budget Constraints and Fiscal Realities

1. Environmental mitigation costs must be estimated and included in NEPA analysis

The NEPA analysis should be based on reasonable budget expectations, which should be clearly stated. Successful organizations can rarely afford to ignore budgets when developing long-term plans. Without acknowledging budget constraints, the mitigation plans and hence resource protection described in management plans will not be attainable. Rather than presenting the maximum production potential of public lands unconstrained by budgets, the agency should consider presenting the public with a more accurate picture of what can actually be accomplished given expected appropriations. Williams (1998) says, "policy is the effective result of 'what is intended' and 'what actually happens.'" (p. 456) One of the purposes of the NEPA process is to produce documents that will help set policy for the future management of an area.

The agency must include a fiscal analysis of each alternative's implementation and mitigation costs. We are especially concerned with a potential lack of analysis of the costs to mitigate the environmental consequences of each alternative. Ignoring budget constraints is completely unrealistic and somewhat deceiving to the public, because planners have not considered the costs of implementing each alternative and the costs of mitigating the potential damage from each alternative. While the budget available to manage the planning area should be considered constant across alternatives, the costs to implement each management alternative are not equal. For example, an alternative resulting in resource damage will require more money to mitigate this damage than a less damaging alternative. It makes no sense for taxpayers to subsidize a more damaging and costly alternative when a less damaging, less costly alternative is available. There is simply no justification for any assumption that funding will be sufficient to implement each alternative and that all resource damage will be fully mitigated – unless costs and budgets are fully analyzed.

According to a Council of Environmental Quality memorandum on NEPA requirements [cited in NEPA Compliance Manual, 2nd Edition (Freeman, et al. 1994)]:

> [T]o ensure that environmental effects of a proposed action are fairly assessed, the probability of the mitigation measure being implemented must also be discussed. Thus the EIS and the Record of Decision should indicate the likelihood that such measures will be adopted or enforced by the responsible agencies. (Section 1502.16(h), and 1505.2)

The "probability of mitigation measures being implemented" is directly related to how much the mitigation will cost and how those costs relate to the expected budget available. The U.S. General Accounting Office (1992) reviewed federal land management budgets and found that the funding received by public land management agencies has been significantly less than the budgets required to fully implement plans. The lower-than-planned budgets have prevented public agencies from producing many of the outputs projected in land management plans, and implementing mitigation measures promised in NEPA documents (Morton 1997).

2. Bonding requirements for industry must be estimated and included in NEPA analysis

As part of the fiscal analysis of the plan alternatives, the agency must also realistically assess the bonding needs for the oil and gas development proposed. Operators must be required to post adequate bonds to ensure that acceptable reclamation and remediation are conducted. Insufficient bonds will increase the costs of cleanup for taxpayers and/or reduce the likelihood that reclamation will be adequate.

<u>In order to fully comply with NEPA, the agency must include an analysis of the costs of implementing each alternative, which includes the costs of the mitigation plans contained within each alternative. These costs must then be compared to the expected budget level to assess the probability of mitigation measures being fully implemented. The agency should therefore, as part of the NEPA process, include a reasonable budget limitation and evaluate a set of management alternatives that are constrained by that budget level.</u>

3.The cost of enforcement of environmental protection and mitigation requirements must be estimated and included in NEPA analysis

Additional costs are associated with the inability of agency enforcement staff to adequately inspect oil and gas wells and associated facilities for violations of applicable laws and to enforce requirements for protection and restoration of the area. A recent report by the Western Organization of Resource Councils (2005) found that:

- agency enforcement staff levels have not kept pace with the rapid expansion of oil and gas development;
- oil and gas wells and associated facilities are not inspected often enough;
- agency environmental compliance inspectors spend too much time on other activities;
- agencies take too few enforcement actions; and
- citizen complaints are often ignored.

The Government Accountability Office (2005) also found a similar lack of resources for monitoring and enforcement of oil and gas development and attributed this lack to an unbalanced emphasis on processing permits to drill. The resulting costs are evidenced in the impact on the ecosystem.

The agency must assess the adequacy of funding and staffing to achieve the required environmental and safety enforcement for an oil and gas development. If inadequate funding and/or staff resources might prevent thorough enforcement and monitoring, this needs to be made clear and the costs associated with the additional impacts must be analyzed as part of the NEPA process.

IV. Specific Recommendations for Analysis of Social and Economic Impacts of Oil and Gas Development

These recommendations are organized to correspond with the more detailed sections above. We formally request that the NEPA analysis fully reflect and account for the following scoping comments:

A. The agency must base analyses of the impacts of oil and gas development proposals on estimates of economically recoverable resources, rather than technically recoverable resources.

We formally request that the Reasonably Foreseeable Development scenario be based on economically recoverable amounts of oil and gas, not technically recoverable oil and gas.

We formally request that estimates of jobs and income and local and state revenues be based on economically recoverable amounts of oil and gas, not technically recoverable oil and gas.

B. The plan must reflect an accurate and realistic projection of jobs and income associated with the oil and gas development proposal.

We formally request that the agency stop relying on IMPLAN and other models derived from economic base theory.

The agency must fully discuss the assumptions, the shortcomings, and the risk and uncertainty due to the poor track record of the IMPLAN model in planning efforts.

We request that all data and multipliers used in the socio-economic impact analysis, including those used in IMPLAN be made public.

If planners use IMPLAN, the model must account for non-labor income, as well as income from hunting, fishing, and recreation. If the agency uses IMPLAN, it must also account for the fact that most drilling is completed by non-local wildcat crews. If the agency uses IMPLAN, the analysis must account for increased labor productivity and hence declining jobs per well drilled.

B. The plan must reflect an accurate and realistic projection of jobs and income associated with the oil and gas development proposal.

If the agency uses IMPLAN, it must also account for the fact that most drilling is completed by non-local crews.

If the agency uses IMPLAN, the analysis must account for increasing labor productivity and hence declining jobs per well drilled.

The agency must also complete a trend analysis of regional jobs and income – to provide a better and more complete understanding of their economic past and their economic future.

We formally request and recommend that the agency rely on trend analysis of income and employment for the counties impacted using the Economic Profile System (EPS) developed by the Sonoran Institute in cooperation with the BLM (available at http://www.sonoran.org).

C. The agency must make accurate and realistic estimates of gross and net revenues.

We requests that the agency determine all applicable Federal, state and local tax laws (including exceptions and reductions) and that these laws and regulations be used to make realistic and accurate estimates of net tax revenues from oil and gas production.

Revenue estimates must be made based on economically recoverable resources rather than technically recoverable – and must include the environmental and community costs from drilling and production.

D. The agency must Include a full accounting of the hidden economic costs from oil and gas extraction.

E. The agency must analyze and discuss the socio-economic costs to communities associated the boom and bust cycles of oil and gas development.

We formally request that the agency estimate the costs associated with oil and gas development to private landowners as part of the NEPA process.

When estimating the benefits of an oil and gas development project the agency must show these benefits as net benefits rather than gross benefits.

The increased public service and infrastructure costs associated with expedited oil and gas development must be fully accounted for as part of the NEPA process for the current push to develop oil and gas in the West.

The impacts on local economic diversity, the socio-economic risks to communities from cycles of boom and bust, as well as the economic instability associated with oil and gas development, must be analyzed and addressed as part of the NEPA process.

A thorough plan for monitoring the socio-economic impacts of oil and gas development must be developed and implemented as part of the NEPA process and the implementation of all development and non-development alternatives.

F. The agency must fully and correctly account for the environmental costs of oil and gas development.

Impacts on water resources must be analyzed and accounted for

When proposing oil and gas development, the agency must fully examine and account for the risks and costs associated with water depletion, loss of native fisheries and fisheries restoration, the additional costs of noxious week mitigation, and the costs associated with the building and potential failure of artificial water retention.

F. The agency must fully and correctly account for the environmental costs of oil and gas development.

We formally request that the impacts on water quality from oil and gas be fully analyzed and the costs of these impacts included in the NEPA process for oil and gas development.

The full extent of the footprint of oil and gas development must be analyzed and accounted for in the NEPA process

We formally request that the agency provide an accurate estimate of the numbers of both producing wells and dry holes and that the impacts of these wells be analyzed fully as part of the NEPA process.

We formally request that the agency require phased development of oil and gas resources on public lands, and that the costs associated with rapid development be fully analyzed as part of the NEPA process.

Wildlife fragmentation results in both market and non-market costs. These costs must be analyzed as part of the NEPA process for oil and gas development.

The environmental costs associated with construction, maintenance, and repair of pipelines, as well as the costs of the habitat fragmentation pipelines cause must be examined as part of the NEPA process for and oil and gas development.

Roads

The agency must include a detailed analysis of the costs associated with increased road mileage as part of the NEPA analysis.

The costs for road maintenance must be accounted for in the NEPA process.

The agency must make a realistic estimate of the probability for enforcement of existing environmental protection

The agency must assess the adequacy of funding and staffing to achieve the required environmental and safety enforcement for an oil and gas development. If inadequate funding and/or staff resources might prevent thorough enforcement and monitoring, this needs to be made clear and the costs associated with the additional impacts must be analyzed as part of the NEPA process.

G. The agency must correctly account for budget constraints and fiscal realities.

In order to fully comply with NEPA, the agency must include an analysis of the costs of implementing each alternative, which includes the costs of the mitigation plans contained within each alternative.

These costs must then be compared to the expected budget level to assess the probability of mitigation measures being fully implemented.

The agency should therefore, as part of the NEPA process, include a reasonable budget limitation and evaluate a set of management alternatives that are constrained by that budget level.

As part of the fiscal analysis of the plan alternatives, the agency must realistically assess the bonding needs for the oil and gas development proposed. Operators must be required to post adequate bonds to ensure that acceptable reclamation and remediation are conducted.

V. References

Allan, J. D. 2002. *Comments* Submitted on the Montana Statewide Draft Oil and Gas Environmental Impact Statement (EIS) and Amendment of the Powder River and Billings Resource Management Plans

Attanasi, E.D. 1998. Economics and the 1995 National Assessment of United States Oil and Gas Resources. US Geological Survey Circular 1145. Available at: http://pubs.usgs.gov/circ/1998/c1145/c1145.pdf

BBC Research and Consulting. November 12, 2001. Measuring the Impact of Coalbed Methane Wells on Property Values, Appendix B of the La Plata County Impact Report (Appendix B: http://co.laplata.co.us/pdf/plan_doc/final_impactrpt/final_ir_appb.pdf, Full report: http://co.laplata.co.us/publications.htm)

Clements, W.H. 2002. Expert Comments. Submitted on the Montana Statewide Draft Oil and Gas Environmental Impact Statement (EIS) and Amendment of the Powder River and Billings Resources Management Plans (RMPs). (On file with the authors.)

Corn, M.L., B.A. Gelb and P. Baldwin. 2001. The Arctic National Wildlife Refuge: The Next Chapter. Congressional Research Service. Updated August 1, 2001. Available at: http://cnie.org/NLE/CRSreports/Natural/nrgen-23.cfm

Darin, T. 2000. Coal-bed methane coming to a town near you. Frontline Report. Wyoming Outdoor Council. Spring 2000. Available at: http://www.wyomingoutdoorcouncil.org/news/newsletter/docs/2000b/

Fortmann, L.P. et al. 1989. Community stability: The foresters' fig leaf. In D.C. Le Master and J.H. Beuter (Eds.) Community stability in forest-based economies. Timber Press.

Freeman, L.R.; March, F,; Spensley, J.W. 1994. NEPA Compliance Manual, 2nd Edition. Government Institutes, Inc., Rockville MD.

Freudenburg, W.R. 1992. Addictive economies: extractive industries and vulnerable localities in a changing world economy. Rural Sociology. Vol. 57:305-332.

Freudenburg, W.R. and R. Gramling. 1994. Natural resources and rural poverty: A closer look. Society and Natural Resources. Vol. 7. 5-22

Gauthier-Warinner, R.J. 2000. Oil and gas development. In: Drinking water from forests and grasslands: A synthesis of the scientific literature. Dissmeyer, G. E. ed. Gen. Tech. Rep. SRS-39. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 246 p. Available at: http://www.srs.fs.usda.gov/pubs/gtr/gtr_srs039/index.htm

Goldsmith, O.S. 1992. Economic instability in petroleum-based economies. Presented at OPEC/Alaska Conference on Energy Issues in the 1990's. Anchorage AK, July 23-24, 1992.

Gore, J.A. 2002. Comments Submitted on the Montana Statewide Draft Oil and Gas Environmental Impact Statement (EIS) and Amendment of the Powder River and Billings Resource Management Plans (RMPs).

Guilliford, A. 1989. Boomtown Blues: Colorado Oil Shale 1885-1985. Niwot, CO: University Press of Colorado.

Hartley, D.A.; Thomson, J.L.; Morton, P.; and Schlenker-Goodrich, E. 2003. Ecological Effects of a Transportation Network on Wildlife: A Spatial Analysis of the Upper Missouri River Breaks National Monument. Available at: http://www.wilderness.org/Library/Documents/upload/Missouri-Breaks-Transportation-Effects-full-report-w-o-covers.pdf

Haynes, R. W.; Horne, A.L. 1997. Economic Assessment of the Basin. In T.M. Quigley and S.J. Arbelbide (eds.), An assessment of ecosystem components in the Interior Columbia Basin and portions of the Klamath and Great Basins: Volume IV. 1715-1870. USDA Forest Service, PNW-GTR-405, Pacific Northwest Research Station, Portland, OR.

High Country News. 2005. Methamphetamine fuels the West's oil and gas boom. By Patrick Farrell. October 3, 2005. Paonia, CO. Available at: http://www.hcn.org/servlets/hcn.Article?article_id=15811

Hoekstra, T.W., Alward, G.S., Dyer, A.A., Hof, J.G., Jones, D.B., Joyce, L.A., Kent, B.M., Lee, R., Sheffield, R.C., Williams, R. 1990. Analytical tools and information. Critique of Land Management Planning, Volume 4. USDA Forest Service, FS-455. 47 pp. Available at: http://www.fs.fed.us/institute/planning_center/1990_Critique_First_Planning_Round/critique%20of%20LMP-Vol%204%20ACR5%2090.pdf

Hoffman, S.A. and Fortmann, L. 1996. Poverty in forested counties: an analysis based on aid to families with dependent children. In Sierra Nevada Ecosystem Project: Final report to Congress, vol. II, Assessments and scientific basis for management options. Davis: University of California, Centers for Water and Wildland Resources, 1996.

Humphrey, C.R.; G. Berardi, M.S. Carroll, S. Fairfax, L. Fortman, C. Geisler, T.G. Johnson, J. Kusel, R.G. Lee, S. Macinko, N.L. Peluso, M.D. Schulman, P.C. West. 1993. Theories in the study of natural resource-dependent communities and persistent poverty in the United States. In Persistent poverty in rural America., ed. Rural Sociological Society Task Force on Persistent Rural Poverty. Boulder, CO: Westview Press.

Krikelas, A.C. 1991. Industry structure and regional growth: A vector autoregression forecasting model of the Wisconsin regional economy. Ph.D. Dissertation. University of Wisconsin-Madison.

Krikelas, A.C. 1992. Why regions grow: A review of research on the economic base model. Economic Review. Vol. 77(4).

LaTourrette, T., Bernstein, M., Holtberg, P., Pernin, C., Vollaard, B., Hanson, M., Anderson, K., Knopman, D. 2002. Assessing Gas and Oil Resources in the Intermountain West: Review of Methods and Framework for a New Approach. RAND Science and Technology, Santa Monica, CA. 94 pp. Available at: http://www.rand.org/publications/MR/MR1683/

LaTourette, T., M. Bernstein, M. Hanson, C. Pernin, D. Knopman, A. Overton. 2003. Assessing Natural Gas and Oil Resources: An Example of a New Approach in the Greater Green River Basin. RAND Science and Technology, Santa Monica, CA. Available at: http://www.rand.org/pubs/monograph_reports/MR1683/

Laitner, S.; Bernow, S. DeCicco, J. 1998. Employment and other macroeconomic benefits of an innovation-led climate strategy for the United States. Energy Policy 26(5): 425-432.

Limerick, Patricia Nelson; Travis, William; Scoggin, Tamar. 2002. Boom and bust in the American West. Workshop Report. Center of the American West, University of Colorado, Boulder, CO. Available at: http://www.centerwest.org/boom_bust.html

Loomis, J. 1993. Integrated public lands management. Columbia University Press, New York

Lutz, D. W., B.F. Wakeling, L.H. Carpenter, D. Stroud, M. Cox. D. McWhirter, S. Rosenstock. L.C. Bender, and A.F. Reeve. 2003. Impacts and changes made to mule deer habitat. Pages 13-61 in: de Vos, J.S. Jr., M.R. Conover, N.E. Headrick, Eds. Mule Deer Conservation: Issues and Management Strategies. Jack H. Berryman Institute Press, Utah State University, Logan, UT.

Lyon, L.J. and A. G. Christensen. 2002. Elk and land management. Pages 557-581 in: Toweill, D.E. and J.W. Thomas, Eds. North American Elk Ecology and Management. Smithsonian Institution Press, Washington, DC.

McLeod, D., C. Kruse, J. Woirhaye. 1998. Results from a Land Use Survey in Sublette County, Wyoming. Agricultural Experiment Station Publication B-1067. University of Wyoming, College of Agriculture, Laramie. Available at: http://agecon.uwyo.edu/EconDev/PubStorage/B-1067.pdf

Morton, P. 1997. Sustaining recreation resources on the Southern Appalachian National Forests. Journal of Park and Recreation Administration. Vol. (15):4, pp 61-78.

Morton, 1999. The economic benefits of wilderness: theory and practice. Denver University Law Review, Vol. 76, No. 2

Morton, P. C. Weller, J. Thomson. 2002. Coalbed Methane and Public Wildlands: How Much and at What Cost? Presented at Coalbed Methane Development in the Intermountain West, the Natural Resources Law Center, University of Colorado, Boulder CO. pp156-175. Available at http://www.cbmclearinghouse.info/documents.html

Morton, P., C. Weller, and J. Thomson, 2002. Energy and western wildlands: A GIS analysis of economically recoverable oil and gas. The Wilderness Society, Denver, CO and Seattle, WA Available at: http://www.wilderness.org/Library/Documents/Energy_WesternWildlands.cfm and attached.

Morton, P., Weller, C., Thomson, J., Haefele, M., Culver, N. 2004. Drilling in the Rockies: How much and at what cost? Available at: http://www.wilderness.org/Library/Documents/upload/Drilling-in-the-Rocky-Mountains-How-Much-and-at-What-Cost.pdf and attached

National Interagency Fire Center. 2006. Wildland Fire Stats, Lightning Versus Human Caused Fires and Acres. Available at: http://www.nifc.gov/stats/index.html

National Petroleum Council. 2003. Balancing Natural Gas Supply: Fueling the Demands of a Growing Economy, Volume IV Supply Task Group Report. National Petroleum Council, Committee on Natural Gas: Washington DC. Available at: http://www.npc.org/

Nelson, P.B. 1999. Quality of life, nontraditional income, and economic growth: new development opportunities for the rural west. Rural Development Perspectives. 14(2): 32-37.

New Mexico Oil Conservation Division. 2005. Generalized Record of Groundwater Impact Sites. Released September 30, 2005 by the Oil Conservation Division of the Energy, Minerals and Natural Resources Department Available at: http://www.emnrd.state.nm.us/EMNRD/ocd/documents/rptGeneralizedGWImpact.pdf

Pederson Planning Consultants, 2001. Appendix D in the Wyoming Energy Commission, Preliminary Progress Report to the Wyoming Legislature, Joint Minerals, Business and Economic Development Committee, December 14, 2001. Draft Report commission by the Wyoming Energy Commission. 34 pages.

Pinedale Anticline Working Group. 2005. BLM Pinedale Anticline Working Group PAWG Task Groups' Report.

Porter K., L. Ziegler, K. Lumsden, E. Vajda, C. Collins. 2004. Sublette County Community Assessment. Wyoming Rural Development Council, Cheyenne, WY. Available at: http://www.wyomingcommunitynetwork.com/FinalReports/Pinedalefinal.pdf

Power, T. 1995. Economic well being and environmental protection in the Pacific Northwest: a consensus report by Pacific Northwest economists. Missoula, MT: University of Montana.

Power, T. M. 1996. Lost landscapes and failed economies. Island Press, Covelo, CA.

Rasker, R. 1994. A new look at old vistas: the economic role of environmental quality in western public lands. University of Colorado Law Review. Volume 52, Issue 2 pp369-399.

Richardson, H.W. 1985. Input-Output and Economic Base Multipliers: Looking backward and forward. Journal of Regional Science Vol. 25(4).

Rose, P. 2001. Risk Analysis and Management of Petroleum Exploration Ventures. AAPG Methods in Exploration Series, No. 12. Tulsa OK: The American Association of Petroleum Geologists. 164 p.

Sawyer, H., R. Nielson, D. Strickland, and L. McDonald. 2005. Annual Report, Sublette Mule Deer Study (Phase II): Long-term monitoring plan to assess potential impacts of energy development on mule deer in the Pinedale Anticline Project Area. Western Ecosystems Technology, Inc. Cheyenne, WY. Available at http://www.west-inc.com/reports/PAPA_2005_report_med.pdf.

Shanley, K.W.; Robinson, J.; Cluff, R.M. 2004. Tight-gas myths, realities have strong implications for resource estimation, policymaking, operating strategies. Oil and Gas Journal, August 2, 2004. Available at: http://www.discovery-group.com/Shanley,%20Robinson,%20Cluff%202004%20-%20OGJ%20Tight%20gas%20myths.pdf

Smith, Edward J. 1986. Boom and bust in energy extraction. Agriculture and Rural Economics Division, Economic Research Service, U.S. Department of Agriculture, Washington, DC. Staff Report No. AGES860423.

Stevens, J.B. 1978. The Oregon wood products labor force; job rationing and worker adaptions in a declining industry. Special Report 529, Ag. Exp. Station, Oregon St. Univ., Corvallis OR.

Taxpayers for Common Sense. 2004. Road Wrecked: Why the $10 Billion Forest Service Road Maintenance Backlog is Bad for Taxpayers. Taxpayers for Common Sense: Washington DC. 16 pp. Available at: http://www.taxpayer.net/forest/roadwrecked/RoadWreckedFINAL.pdf

The Craig Daily Press. 2004. Counties discuss sharing resources. By Bob Gebhart. July 7, 2004. Craig, CO. Available at: http://www.craigdailypress.com/section/localnews/story/12740

The Craig Daily Press. 2005. Residents mull magwater issue. By Bob Gebhart. March 9, 2005. Craig, CO. Available at: http://www.craigdailypress.com/section/localnews/story/16200

The Wilderness Society. 2004a. A GIS analysis of economically recoverable gas and oil in the Rocky Mountain Front of Montana. May 3, 2004. Available at: http://www.wilderness.org/Library/Documents/upload/GIS-Analysis-of-Economically-Recoverable-Gas-and-Oil-in-the-Rocky-Mountain-Front-of-Montana.pdf

The Wilderness Society. 2004b. A GIS analysis of economically recoverable gas and oil underneath the Roan Plateau, Colorado. October 26, 2004. Available at:

http://www.wilderness.org/Library/Documents/upload/A-GIS-Analysis-of-Economically-Recoverable-Gas-and-Oil-Underneath-the-Roan-Plateau-Colorado.pdf

Thomson, J.L.; Hartley, D.A.; Ozarski, J.; Murray, K.; and Culver, N.W. 2004. Protecting Northern Arizona's National Monuments: The Challenges of Transportation Management. Available at: http://www.wilderness.org/Library/Documents/AZStripTransportation.cfm and attached

Thomson, J.L.; Schaub, T.S.; Culver, N.W. Aengst, P.C. 2005. Wildlife at a Crossroads: Energy Development in Western Wyoming, Effects of Roads on Habitat in the Upper Green River Valley. Available at: http://www.wilderness.org/Library/Documents/pinedale.cfm and attached.

Tiebout, C.M. 1956. Exports and regional economic growth. Journal of Political Economy 64:160-64.

Trombulak, S.C. and C.A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. *Conservation Biology* 14:18-30.

Trout Unlimited. 2004. Annotated Bibliography of the Potential Impacts of Gas and Oil Exploration and Development on Coldwater Fisheries. Available at: http://www.tu.org/atf/cf/%7B0D18ECB7-7347-445B-A38E-65B282BBBD8A%7D/Oilgas_biblio.pdf

U.S. Congress, Office of Technology Assessment. 1992. Forest Service planning: Accommodating uses, producing outputs, and sustaining ecosystems, OTA-F-505. Washington, DC.

U.S. Department of Agriculture, Forest Service. 2000. Forest Service Roadless Area Conservation Final Environmental Impact Statement. USDA Forest Service, Washington, DC. Available at: http://roadless.fs.fed.us/documents/feis/

U.S. Department of the Interior, U.S. Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2001. National Survey of Fishing, Hunting, and Wildlife-associated Recreation. Available at: http://www.census.gov/prod/www/abs/fishing.html

U.S. Geological Survey. 1996. Impact of Oil and Gas Activity on Land-Use Management Decisions. http://energy.usgs.gov/factsheets/GIS/gis.html

U.S. Government Accountability Office. 2005. Oil and Gas Development: Increased Permitting Activity Has Lessened BLM's ability to Meet Its Environmental Protection Responsibilities. Report to the Ranking Minority Member, Committee on Homeland Security and Governmental Affairs, U.S. Senate. June 2005. GAO-05-418. Available at: http://www.gao.gov/new.items/d05418.pdf

U.S. General Accounting Office. 1992. Natural Resources Management Issues. GAO/OCG-92-17TR. GAO, Washington, D.C.

Vidas, E. H., R.H. Hugman, and P.S. Springer. 2003. Assessing Natural Gas and Oil Resources: Technical Details of Resource Allocation and Economic Analysis: RAND Science and Technology, Santa Monica, CA. 79 p. http://www.rand.org/pubs/monograph_reports/2005/MR1683.1.pdf

Weller, C.; Thomson, J.; Morton, P. and Aplet, G. 2002. Fragmenting our Lands: The Ecological Footprint of Oil and Gas Development. Available at: http://www.wilderness.org/Library/Documents/upload/Energy-Footprint-Full-Report.pdf and attached

Western Organization of Resource Councils. 1999. Coal-bed methane development: boon or bane for rural residents? Billings, MT. Available at: http://www.worc.org/pdfs/cbm.pdf

Western Organization of Resource Councils. 2005. Law and Order in the Oil and Gas Fields: A Review of Inspection and Enforcement Programs I Five Western States. Available at : http://www.worc.org/pdfs/Oil%20and%20Gas%20Report04.pdf

Williams, P.B. 1998. Considering the role of science within the policy and planning process for the Grand Staircase-Escalante National Monument. In: Learning from the Land: Grand Staircase-Escalante National Monument Science Symposium proceedings. Hill, L.M. and Koselak, J.J. (eds.) 455-465. U.S. Dept. of Interior, Bureau of Land Management, Grand Staircase-Escalante National Monument, BLM/UT/GI-98/006+1220.

Whitelaw, E., et al. 2003. A letter from economists to President Bush and the governors of eleven western states regarding the economic importance of the west's natural environment. (100 total authors) Available at: http://www.econw.com/pdf/120303letter.pdf

Wyoming Game and Fish Department. 2004. Recommendations for Development of Oil and Gas Resources within Crucial and Important Wildlife Habitat: A Strategy for Managing Energy Development Consistently with the FLPMA Principles of Multiple Use and Sustained Yield. Available at http://gf.state.wy.us/habitat/index.asp.

Wyoming Oil and Gas Conservation Commission. 2006. Data on coalbed methane production 1987 to 2006 downloaded on April 14, 2006. http://wogcc.state.wy.us/

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