Navigating beyond the resource curse: Do local monitoring programs empower fracking host communities?

Julia Hobson Haggerty, Ph.D. and Keegan McBride

November, 2014

Abstract:

Rural communities experiencing or anticipating High Volume Hydraulic Fracturing (HVHF) oil and natural gas activity face real challenges in integrating this intensive form of development with strategic plans for long-term prosperity. This paper observes an absence of formal social and economic impact assessment, monitoring, and mitigation programs at the state level in several major HVHF development areas in the United States, and functional deficiencies in federal programs. Given this institutional void, local approaches to socioeconomic impact monitoring and mitigation have great importance. We present the experiences of one rural county, Sublette, Wyoming, as an instructive case study that suggests local HVHF governance innovations can lead to creative solutions to the absence of effective state policy and federal programs. Yet in terms of their capacity to navigate a course away from the dreaded "resource curse," local approaches to monitoring and mitigating impacts of HVHF are far from ideal. In the absence of stronger regulatory frameworks and targeted funding for implementation, existing socioeconomic monitoring and mitigation solutions are unlikely to provide effective interventions with regards to long-term social and economic risks to the prosperity of rural communities.

1. Introduction

> *"A few years ago, [we] set a goal that Mountrail County would be a better place to live and work as this oil play works itself out over the next 30 years. Right now, I would be hard-pressed to find people who agree."—Dave Hynek, County Commissioner, Mountrail County, North Dakota, Feb. 12, 2012*[1]

[1] Quoted in Oldham, 2012.

Unconventional oil and natural gas development is expanding rapidly in the United States, transforming rural landscapes. Development activities associated with High Volume Hydraulic Fracturing (HVHF) often create dramatic surges in local economic activity (Weber, 2013). Yet, achieving long-term rural prosperity from oil and gas development is not a given. The significant socioeconomic risks associated with dependence on extractive industries are well-established (Freudenburg, 1992; Haggerty et al. In Press, Headwaters Economics, 2014; Gulliford, 2003; Jacobsen and Parker forthcoming; James and Aadland, 2011; Papyrakis and Gerlagh, 2007). As sociologist Richard Stedman recently put it, HVHF host communities are at pains to avoid a "state transition" in which HVHF-driven development permanently erodes important local capital (Stedman, 2014). This knowledge extends beyond academia. Many rural communities and local government leaders share the sentiment embodied in the opening quotation of this paper—the hope that this boom could be different if it were managed correctly.

This paper considers the challenges of addressing local socioeconomic impacts from HVHF in the current regulatory and policy environment. We use socioeconomic impacts to refer to changes affecting the social and economic fabric of communities that host HVHF: population, housing, employment, infrastructure, and increased demand for government services, along with more subjective concerns such as sense of place and community character (Jacquet, 2014a). These changes can be related to, but measured in metrics distinct from, biophysical indicators such as air and water quality. We present socioeconomic impact monitoring and mitigation as an example of one of the most important, and most haphazard of the emerging governance solutions in rural areas that host HVHF. In emphasizing monitoring and mitigation, we aim to focus our discussion on activities addressing social and economic impacts beyond *pro forma* pre-development impact assessments and standard planning and zoning activities of local governments.

This is an important distinction. Certainly pre-development impact assessment is important, and it is also true that local government planning departments bear the brunt of responding to many of the immediate impacts of HVHF-led development such as

demand for housing and physical infrastructure such as roads and water and sewer systems. However, our conceptual framework (described in the following section) assumes that the bare minimum of *pro forma* socioeconomic impact assessment and planning is unlikely to result in effective interventions for long-term community development. Monitoring and mitigation of socioeconomic impacts for strategic development goals demand more coordination and integration across community and local government functions and more concerted efforts over time than would typically occur in either the impact assessment or planning realms.

The paper presents the experiences of one rural county, Sublette, Wyoming, as an instructive case study that suggests local HVHF governance solutions can have multiple, contradictory outcomes. Local innovations can be empowering, creative solutions to the absence of effective state policy. But in terms of their capacity to navigate a course away from the dreaded "resource curse," we present evidence of the many challenges facing local governance approaches to monitoring and mitigating impacts of HVHF. In the absence of stronger regulatory frameworks and targeted funding for implementation, local socioeconomic monitoring and mitigation solutions are unlikely to provide effective interventions with regards to long-term social and economic risks to the prosperity of rural communities.

1.1 Social and economic risks specific to HVHF in the rural U.S.

We will not detail the context of rapidly expanding oil and natural gas development in the rural U.S. associated with HVHF (a summary of key trends can be found in Ratner & Tiemann, 2014). From 1998 to 2011, private employment in oil and gas extraction grew by 66 percent to more than 330,000 jobs in the United States.[2] Despite the expansion of HVHF in metropolitan and suburban areas (Jacquet and Kay 2014), oil and gas extraction continues to be over-represented in rural areas. As a share of private employment, oil and

[2] Using 2011 data, oil and gas extraction (NAICS 2111) as a share of private employment is estimated to be 0.8% for non-metropolitan counties, 0.2% for metropolitan counties. Source: U.S. Department of Commerce. 2013. Census Bureau, County Business Patterns. Washington, D.C.

gas extraction is four times more important in non-metropolitan than in metropolitan U.S. counties.[3] The limited size of the workforce, lack of services and infrastructure to accommodate industrial activity and rapid in-migration, along with the likelihood of having relatively less diversified economies, together increase exposure for rural places undergoing new (or renewed) oil and gas drilling (Haggerty & Haggerty, Forthcoming).

Recent studies of the risks of energy development to communities that host HVHF-based oil and gas developments observe a cluster of social, environmental, and economic concerns. Jacquet (2014a) summarizes four main social risks to communities associated with HVHF: rapid industrialization, uneven distribution of costs and benefits, community conflict, and social-psychological stress and disruption. Capacity—resources, expertise, and efficacy—of local actors and institutions influences and is influenced by many of these potential risks. From an environmental standpoint, impaired water quality, as well as wildlife habitat disruption, are known risks of intensive oil and gas drilling (Vengosh et al., 2014; Copeland et al., 2009; Walker et al., 2007).

The long-term effects of HVHF-led development on local economies remain a subject of debate and inquiry. Historically, a sizable body of literature that focused on boom-bust cycles of the 1970s and 1980s confirmed that some version of a resource curse—wherein natural resource abundance is inversely correlated with economic performance—was operating in local economies with substantial levels of dependence on energy resource extraction (*cf.* Freudenburg & Wilson, 2002). Diminished economic performance as a function of county-level dependence on oil and gas development in the Interior West of the United States was recently reaffirmed by two studies considering the post-boom period (Haggerty et al., In press; Jacobsen and Parker, Forthcoming). However, newer studies suggest that the nature of dependence of local economies on oil and gas employment and income in the HVHF development context has shifted dramatically, undermining some of the fundamental assumptions of the resource curse literature. Three studies of county-level performance metrics from the recent oil and natural gas booms in

[3] Ibid.

the U.S. find little evidence of key risk factors of the resource curse at the county scale, such as a strong dependent relationship between mining employment and other employment sectors such as manufacturing (Weber 2012; Weber 2013; Brown 2014). This is consistent with Jacquet and Kay's (2014) emphasis on the changing financial models of oil and gas drilling, and related implications for execution of development activities, as key points of distinction between current U.S. oil and gas production and production during the 1970s-1980s energy booms.

The failure of recent research to identify mechanisms of the resource curse during the latest boom phase of oil and gas development does not negate the risk of potential long-term economic risk associated with commodity-dependence. Even those researchers publishing such results note the potential for the resource curse to operate through other mechanisms unique to the nature of HVHF (*cf.* Weber, 2013: 13). Thus, the conceptual framework operating in this analysis builds on both the resource curse and the sociological literature in assuming that active management of the pace and scale, environmental outcomes, and social and economic impacts of energy development potentially affects the relationship between hosting HVHF and long-term local prosperity. Developing credible information about emerging social and economic impacts and linking them to management decisions represents one strategy for improving outcomes for local economies and communities. With the broader formal regulatory regime evolving more slowly, *ad hoc*, local-scale governance has been at the center of interventions to shape outcomes of contemporary HVHF production for host communities.

The specific mechanics of how management solutions shape community outcomes will not be known until researchers have had more time to study the ongoing unconventional oil and gas development. In the meanwhile, it is important to consider the emerging institutions that attempt to wrestle with oil and gas management at the community level. In this paper, we identify the emergence of *ad hoc* governance models as models of managing community impacts from HVHF. Next, we analyze two phases of a governance experiment focused on socioeconomic impact monitoring and mitigation in Sublette County, Wyoming. We consider the case study from three perspectives: the major

influences on the form of the governance institutions; the activities they undertook; and outcomes in terms of empowering local communities and governments to address impacts from HVHF.

2.0 Socioeconomic assessment and monitoring practices

In order to situate the Sublette County case study, we scanned the policy and practices guiding socioeconomic planning, monitoring, and mitigation in two other major unconventional oil and gas development areas with large rural populations: the Bakken (North Dakota and Montana) and the Marcellus (Pennsylvania). Our goal was to understand the following features of socioeconomic impact assessment and mitigation in the context of HVHF: 1) the existence of formal federal, state, or local requirements for socioeconomic impact assessments; 2) the extent and type of regional planning, the use of socioeconomic information therein, and the degree of inclusion of community representatives; and 3) the extent and form of socioeconomic assessment, monitoring, and mitigation at the local level. To develop this background information, we supplemented archival research in state laws and planning documents with phone interviews with local government representatives and other knowledgeable individuals from universities and state agencies.

2.1 Formal requirements of socioeconomic impact assessment

None of the states we researched (ND, MT, PA) have state laws that mandate socioeconomic impact assessment as a condition of approval for a permit to drill for oil and gas. This means that mandated pre-development socioeconomic analysis only takes place when federal permits to drill are involved. The U.S. National Environmental Policy Act of 1972 (NEPA) mandates Environmental Impact Statements for most major federal land use decisions that generate socioeconomic concerns. However, over time, the prominence and rigor of socioeconomic discussions in the NEPA process has diminished significantly in comparison to environmental and biophysical considerations. In many oil

and gas permitting scenarios by the Bureau of Land Management (BLM), consultants execute socioeconomic impact assessment using formulaic templates and public datasets. They rarely visit affected communities or collect original data (Jacquet, 2014b, citing Burdge, 2002).

Several states have implemented formal energy assistance (*e.g.,* mitigation) programs that could encourage case-by-case impact measurement and monitoring as a way to award mitigation funding. This includes North Dakota and Pennsylvania, both of which, through 2013 and 2011 laws, created opportunities for direct impact assistance to areas that host energy development. However, neither North Dakota's grant-funded program nor Pennsylvania's impact-fee model will, in fact, lead to socioeconomic monitoring. North Dakota awards grants for infrastructure (the legislation specifically excludes financing for "sociological impacts or services or facilities to meet secondary impacts") based on demonstrated fiscal shortfalls (North Dakota Energy Infrastructure and Impact Office). Pennsylvania's Act 13 creates local authority to levy impact fees. Where levied, the funding accrues according to formula to counties and municipalities that have wells, regardless of demonstrated impact (Citizens for Pennsylvania's Future, 2012).

In other states, assistance to communities hosting intensive energy development occurs as part of existing community development programs. For example, the Montana Department of Commerce's Community Technical Assistance Program developed a special itinerary and supporting training modules to assist communities in eastern Montana dealing with rapid population growth as a result of HVHF activities in the Bakken (Montana Department of Commerce, no date). The agency initiated the program despite legislative resistance to addressing shortfalls in available mitigation funding. The activities may have prompted some social impact assessment, but the focus was technical support for planners, not impact measurement.

Another approach involves state-directed inquiries into socioeconomic impacts. For example, in the midst of continued debate over how to best address the absence of a severance tax to fund mitigation of energy development impacts, Pennsylvania's governor

established a Marcellus Shale Advisory commission that prompted a review of impacts by a 30-member multi-stakeholder group that issued a one-time report (Pennsylvania Department of Environmental Protection, 2014). In addition, the state legislature funded research for a new set of social and economic impact assessments by academic researchers that will evaluate extensive data on " housing, economies, crime, agriculture, health and traffic" (Center for Rural Pennsylvania, 2014). As the lead researcher on this work described it, "as researchers [we] are doing what we can but there is no formal system in play. In fact there is no data plan for any of this. Any data we get is what we can pull from different places" (Dr. K. Brasier, Personal Communication 4/13/2014).

2.2 Regional planning

Regional planning that engages multiple jurisdictions in collective efforts is an essential component of addressing HVHF-related impacts. The juxtaposition of the remoteness of drilling locations (in some plays) with the demand for urban infrastructure from workers makes regional thinking especially important. Regional planning has great potential to build liaisons among affected local governments and to identify efficiencies in delivery of government services. Based on our inquiries in Montana, North Dakota, and Pennsylvania, however, regional planning specific to HVHF-related development typically occurs as a one-off effort funded by a single grant opportunity. While regional planning efforts generate large volumes of socioeconomic data, they rarely have the scope or capacity to maintain, analyze, and share data on an ongoing basis. By its very nature, this is planning, not ongoing monitoring or mitigation.

When executed with ample budget and robust resources, regional planning can provide a useful foundation for future socioeconomic monitoring. This is the case with the VisionWest North Dakota planning effort. The process, supported by a $1.5 million U.S. Department of Housing and Urban Development grant along with state funds from North Dakota, engaged a number of stakeholders including tribes and 19 counties in the Bakken region in a cooperative effort to develop county comprehensive plans and a regional plan to consider long-term impacts of the oil boom. Plans were completed in 2013 and 2014. In

addition to being a successful planning effort that gathered extensive primary and secondary data, the process was notable for the genuine engagement of many community members as well as local government staff. One local planner described the process of developing the comprehensive plan using town hall-style meetings as "democracy at its core" (T. Williams, Personal Communication, 3/15/2014). With ongoing support, such a planning effort could serve as a basis for future monitoring and assessment.

Based on our review of existing practices in the Marcellus and Bakken oil and gas development regions, it becomes clear that there is little in the way of systematic efforts to use data to track local social and economic outcomes of oil and gas development on an ongoing basis. This leaves many regions on their own to develop social and economic impact information. Little research or public information considers whether such efforts proceed at all, and if so, what the outcomes have been for linking HVHF development to sustainable economic growth. The following section considers a unique approach to monitoring and mitigating social and economic impacts from energy development developed in Sublette County, Wyoming in the mid-2000s.

3.0 Project Background: Socioeconomic impact monitoring and mitigation in Sublette County, Wyoming

Sublette County's boom involved HVHF for natural gas in the Green River Basin geologic formation. Over the course of the major buildup in HVHF development between 2000 and 2008, socioeconomic impact monitoring and mitigation occurred in two local institutions: the Socioeconomic Task Group (SETG) associated with a federal adaptive management initiative called the Pinedale Anticline Working Group (PAWG); and an effort led by local governments and supported by the state of Wyoming known as the Sublette Community Partnership (SCP).[4] These were both new monitoring and mitigation efforts that

[4] The groups' web sites are: PAWG, http://www.blm.gov/wy/st/en/field_offices/Pinedale/pawg.html; and SCP, http://www.pinedaleonline.com/socioeconomic/.

developed beyond of the scope of traditional local government planning and zoning activities. We consider the case studies from three perspectives: drivers and organizations; the activities they undertook; and outcomes from the perspective of managing energy impacts and engaging community.

To develop this case study on Sublette County, we reviewed archival materials (such as meeting notes, memos, unpublished reports) of the two groups, searched local news media coverage of the groups' activities, and conducted interviews with six key stakeholders from the two groups. We also analyzed transcripts of oral history interviews conducted in 2010 that documented activities in the area (American Heritage Center, 2010).

3.1 Context and background

Sublette County is a large, geographically isolated county with a population estimated at about 10,000. Rich in scenic and recreational amenities, particularly those associated with hunting, fishing, and mountain activities, Sublette County covers an immense swath of territory ranging from high mountain peaks to cold desert hills dominated by sagebrush. The natural gas development activity of the 2000s was dramatic. By one count, producing wells increased from 26 in 1995 to 2,964 in 2008 (Benson, 2009). Energy development in Sublette County centers on a constellation of resources in the Greater Green River Basin that are located primarily on public land in southern and central parts of the county (See Figure 1 at end). The area has hosted natural gas production for more than 75 years. Historically the most prominent fields were located in the Greater Big Piney-LaBarge area, while the natural gas boom of the 2000s focused on the Jonah Field and the Pinedale Anticline areas. After a major downturn in 2009, drilling in the area has stabilized at a fraction of boom-time numbers (for background, see Noble, 2011).

The location of natural gas resources on public lands created a lead role for federal land managers, specifically the Bureau of Land Management (BLM), in regulating oil and gas development in Sublette County. Interestingly, Wyoming's Industrial Siting Legislation mandates extensive socioeconomic analysis for the purposes of mitigation

(W.S. 35-12-101-119). Oil and gas development is exempt from the siting legislation, however. A key dimension of the federal planning process for development in Sublette County was the commitment to adaptive management in the 2000 Environmental Impact Statement (EIS) that originally permitted drilling in the Pinedale Anticline Project Area (PAPA). The PAPA EIS outlined an adaptive management program guided by the idea that the intensive planned development could be "managed and monitored in a manner that will guide mid-course corrections" (EIS, quoted in Benson, 2009: 10967). The PAPA EIS established a multi-stakeholder working group, the Pinedale Anticline Working Group (PAWG), charged with developing monitoring plans and recommendations to the BLM to implement adaptive management (U.S. BLM, 2000). The BLM touted the PAWG as a progressive solution to the challenges of implementing major industrial development in an area with high recreational, wildlife, and cultural values (U.S. BLM, PAWG, 2004).

While Sublette County had experience with previous episodes of energy development, the rapid pace and scale of development in the early 2000s presented major challenges for community leaders and local residents. The familiar boomtown impacts driven by population growth outstripping the capacity of available housing, services, and infrastructure posed immediate challenges for local government, while the rapid industrialization of a rural, sparsely populated area rich in natural amenities concerned many local residents (for a popular account, see Fuller, 2007). Because the commencement of the PAWG activity was stalled for three years by an industry lawsuit, when the working group convened in 2004, energy development, with its attendant boomtown woes, was in full swing.

The PAPA EIS recommended six categories of resources for monitoring activity by the PAWG (Wildlife, Transportation, Reclamation, Air Quality, Cultural, and Water); socioeconomics was not one of them. However, a representative from the Governor's office recommended a socioeconomics task group during the PAWG's first meeting. Her recommendation was endorsed at the following PAWG meeting, establishing socioeconomics as a seventh PAWG task group (SETG). From the beginning, there were signs that socioeconomic monitoring occupied a tricky space for the PAWG, in part

because the establishing language of the PAWG limited monitoring and mitigation to "on-site" impacts. With development occurring in a remote area, the social impacts occurring in population centers could be interpreted as off-site and beyond the PAWG's purview. As one community representative interpreted it in an interview, "we [the SETG] were the purple-headed stepchild of the PAWG."

This fundamental dilemma about the capacity for or willingness by the BLM to respond to the findings of the SETG ultimately undermined the potential for success. In general, the PAWG produced a huge amount of frustration as the BLM proved unable to act on recommendations, or to genuinely adapt management (Huntington, 2008). After a year of SETG activity, a distinct socioeconomic impact mitigation effort developed in response to increasing evidence that the BLM was unlikely to implement the recommendations of the SETG. This new effort was the Sublette Community Partnership (SCP). Established in 2006 with a three-year charter, the SCP was meant to "help facilitate community planning and decision making." Specifically, the State of Wyoming, Sublette County, and the towns of Big Piney, Marbleton, and Pinedale formed a partnership explicitly focused on measuring and mitigating social and economic impacts of drilling activities. The SCP concluded in 2010. Despite being mostly inactive after 2007, the SETG formally existed until the PAWG was officially terminated in January of 2013 after several years of declining interest and activity.

The SETG and SCP shared geography, some personnel, and a core body of activities focused on collecting and analyzing data about community impacts associated with natural gas drilling. However, the two groups were very different in terms of their origins, execution, and efficacy. This was by design: the SCP was meant to address shortcomings in the SETG and PAWG processes. However, the transition came with tradeoffs in the scope of monitoring and mitigation and of citizen engagement. The following narrative presents the groups' histories and assesses their design, activities, and outcomes.

3.2 SETG: Design and goals

When the Socioeconomic Task Force of the PAWG met for the first time in October of 2004, it was guided by specific procedures outlined in the PAWG's guide, Appendix C to the 2000 PAPA EIS. Prescribed task group functions included preparation and oversight of implementation of a monitoring plan and maintaining a transparent process through recording minutes and making them available to the public. Task group responsibilities were significant, including the full suite of monitoring and evaluation activities that would support adaptive management (see Figure 2 at end).[5] The model was loosely organized around annual monitoring reports to PAWG. Task groups would execute monitoring, evaluate results, and make recommendations—ranked by priority—to the PAWG. The PAWG would then select recommended adaptations to management and mitigation options and provide them to the BLM on annual basis.

In its first meeting, the PAWG came up with a list of possible representatives who could contribute to the SETG: emergency/medical services, schools, housing, law enforcement, city, county, state representatives, legislative, Chamber of Commerce, woman's business group (PAWG, 2004). The need for Task Group representatives was posted by the BLM, and a diverse group primarily comprising concerned citizens volunteered. The first iteration of the group featured two professionals, a BLM socioeconomic specialist to provide technical support and the assistant mayor of Pinedale. The rest of the task group members were volunteer citizens including an archaeologist, a retired teacher, a retiree with school board experience, and a realtor. The group appointed a citizen representative with extensive volunteer experience on local boards as chairperson.

Expectations were high that time put in would result in outcomes at the decision-making level by BLM. As one original member put it: "People were involved because they

[5] In addition, guiding documents clearly stated that the BLM did not have funding to support the process, noting that "the majority of costs to implement these monitoring programs will have to be borne by the operators" (BLM, 2000: C-5). In essence, task groups faced the challenge of shoring up funding for, as well as designing and implementing, monitoring programs mandated by the EIS.

were concerned about community impacts. They anticipated that that these groups would play a role more than just advisory." Continuing, he noted:

> I personally thought that our task group would play a role in the development of those fields. If you had an issue that was evolving you could offer solutions to mitigate impacts and BLM would move on them to the extent that they could. PAWG in general (which we were reporting to)—members had the same anticipation that their input to BLM would play a role in how that resource was developed. Those were the expectations.

3.2 SETG: Major activities

The major activities of the SETG were two annual reports to the PAWG delivered in 2005 and 2006. For the two years when it was active, the group met monthly and members executed assigned tasks independently, with support from a BLM professional. The 2005 report in particular is notable for the involvement of volunteers in generating data and analysis (U.S. BLM, PAWG-SETG, 2005). According to the BLM specialist who assisted in the process, "My role was to sort of organize the effort, such as assigning tasks to every member. They were bringing back the data. It was a cooperative effort. I assembled the data, built the spreadsheets. The group was doing the leg work, bringing stuff into the overall group, putting it together. [The chair] did a lot of the writing. It was an open environment. Data would come in and we would put it together and it was available to everybody."

The SETG's 2005 report confirms much of what research on energy boomtowns predicts: rapid population and employment growth; major shortfalls in available funding to municipalities struggling to meet increased service demand; lack of coordination of and obstacles to revenue-sharing for investments in infrastructure; health care systems stretched; increases in crime outpacing population growth; and social services that were "maxed out" in both counties. Much of the report focuses on documenting the fact that the pace and scale of development were producing impacts that exceeded those anticipated in the original EIS. For example, regarding employment impacts, the report noted:

> The PAPA EIS specified that "a 10 percent change in county government revenues or in county-wide employment" would constitute a Significant

> impact (1999 PAPA EIS p. 4-14). Since BLM's issuance of that statement, county-wide employment has in fact well exceeded the specified 10 percent change on all fronts related to employment. The REIS data presented in the graphs reflect that total wage and salary employment surpassed this threshold by rising 15.2 percent between 1999 and 2002. The more current State-generated estimates indicate that the upward trend in employment accelerates after 2002, so the threshold of a 10 percent increase in county-wide employment has been far surpassed regardless of the data source. As manifest in other sections of this report (i.e., crime, social services), the SocioEconomic impacts of PAPA development have been significant (U.S. BLM, PAWG-SETG, 2005: 12).

The report offered more than 50 recommendations for expanded monitoring of indicators of impacts in the categories described above. The report also proposed mitigation actions ranging from indirect strategies such as "planning for economic diversity" in response to observed labor force shortages, to very specific solutions, such as a request for a human services office in an underserved rural area.

Among its 2005 recommendations, the SETG prioritized two actions. The first was to request that industry provide the data needed to create accurate population growth estimates to inform local planning activities. Specifically, the report recommended that PAPA operators and lessees be asked to provide a 10-year drilling forecast (estimated wells or rig months/year) on an annual basis. In addition, the SETG 2005 report identified a need to hire a dedicated professional to gather and analyze data and disseminate information to affected community institutions.[6]

When the Task Force made its report to PAWG at an April 2005 meeting, the degree of investment that task group members had in the report and its recommendations was clear. The SETG chair observed early in the meeting that the SETG was looking for funding and that "[w]e want to make it clear that we don't want to be on the bottom of the pile." (U.S. BLM, PAWG, 2005a: 3). Ultimately, PAWG forwarded the SETG's priority recommendations to the BLM according to stipulated process. The BLM did enact the request for drilling estimates (although the SETG would be disappointed that the request

[6] In both North Dakota and Montana professionals had been hired to assist with monitoring efforts.

would cover the PAPA only, rather than all drilling in the county, making the information less useful to local governments needing information on all regional drilling activity). With regard to a professional socioeconomic analyst, the BLM reported that the agency would not support a request for funding the position, but would help PAWG lobby the county and state for funding. The Pinedale Field Office Director stated, "I am willing and supportive, but it is the county who needs to take the lead. BLM's job is to protect and manage land and disclose the impacts—not to fix the problem" (U.S. BLM, PAWG, 2005b: 5). The implication for the SETG was that funding for a professional socioeconomic analyst would have to come from sources other than industry. This was somewhat in contrast to the guidance language suggesting that the costs of monitoring would be borne by industry (see footnote 7).

Industry's perspective was difficult to capture accurately in this research as none of the representatives of developers who participated in SETG and PAWG activities were available for interviews—most have left the area and/or changed positions and employers. However, there are signs that industry representatives contributed to a tense atmosphere at PAWG and SETG meetings—such as meeting minutes summarizing disputes about impacts and mitigation responsibilities and including lines such as "we have a philosophical difference of opinion here" (U.S. BLM, PAWG, 2005b: 6).

Interestingly, the industry representative present at the PAWG discussion of the SETG's first report indicated that he supported the socioeconomic analyst position because he understood that a professional approach would be in industry's interest. Namely, he wanted to avoid misattribution of growth effects to oil and gas development. In his words: "We shouldn't lose sight of cause and effect here. We found a multiplicity of data information and supposition in the oil and gas information. We feel we need an expert to look at this to test the sensitivity and relevance related to socioeconomic issues. We are looking for someone who can guide this along. People on the street believe the impacts are significant." (U.S. BLM, PAWG, 2005a: 5). This comment may speak to tension among the stakeholders about ideas about appropriate interpretation of the

report's findings, a tension that several interviewees recalled from early PAWG discussions of socioeconomic issues.

Despite BLM's reticence on the issue of funding a socioeconomic analyst, members of the SETG, in particular municipal and local government officials, identified potential monies from the state's Federal Natural Resource Policy Account (FNRPA) funds.[7] The Wyoming Governor's Office and Sublette County shared the analyst's total annual cost of $80,000. An analyst began working in late 2005, reporting to a new Socioeconomic Analyst Advisory Subcommittee, co-chaired by the BLM economist and an active member of the SETG representing the public at large.

By the time the SETG's annual report was delivered to PAWG in 2006, the analyst had made major inroads into collecting data on all of the topical areas considered in the 2005 report. The 2006 report highlighted three priority areas identified by the SETG: Housing, Crime and Drugs, and Community Sustainability and Connectiveness [sic]. In summarizing findings of the Task Group, the report pointed to the following concerns: an increasing lack of affordable housing, and the related challenge of retaining workers; exponential increases in reported crimes and arrests, and a link between drug use and gas field activity; and perceived negative impacts of the influx of temporary workers on community stability and social dynamics (U.S. BLM, PAWG-SETG, 2006a).

3.3 SETG: Outcomes

The 2006 annual report was the final iteration of a citizen-guided initiative to implement a socioeconomic monitoring and mitigation program as part of a larger federal resource management process. In addition to the findings on housing, workforce retention, crime, and drug use, the 2006 report proposed a set of mitigations including: industry purchase of land for housing to support reduction of "man camps" and

[7] FNPRA is discretionary money from the State of Wyoming General Fund and issued by the Governor's office, to support the participation of local governments in federal natural resource policies that affect their jurisdictions (Wyo. Stat § 9-4-218 (2013)). A typical use of FNRPA funding is to pay specialized contractors or lawyers to represent counties in federal resource management planning processes.

promotion of sustainable community-appropriate housing; industry financing of community infrastructure related to industry growth; industry payment of fair market value for loss of other uses including grazing, hunting, and recreational activities on the PAPA, including the non-market value losses that might occur as a result of intensive development. Versions of some of these ideas would eventually make their way into policy, but at the time, discussions between the BLM, the PAWG, and the SETG were stagnating with the likelihood of the BLM compelling industry mitigation appearing very unlikely.

In May of 2006, the SETG held a county-focused roundtable to evaluate the best way to move socioeconomic impact monitoring and mitigation forward. Notes from these meetings indicate that the second iteration of the PAWG reporting process had solidified perspectives that PAWG was not an effective vehicle for addressing mitigation—according to the minutes: "people want to go from talking to action" (U.S. BLM, PAWG-SETG, 2006a: 1). Chief among concerns voiced at the meeting was that the SETG reporting to PAWG did not result in impact mitigation or adjustments to plans for drilling and as such, was not working. A related issue was the lack of investment by county commissioners in the PAWG approach to socioeconomic issues, in part because the SETG was limited to Pinedale Anticline activities, excluding impacts from drilling in other areas. The group discussed the idea that in addition to an analyst, an individual was needed who could "fill the gaps" and execute the plan of a countywide group, e.g. "a socioeconomic implementer" (PAWG-SETG, 2006a: 2).

From that point, SETG activities effectively stopped. Reporting to the PAWG in January of 2007, the SETG chair noted that most of the group had resigned. The group did not formally convene again until 2009, when a new PAWG charter and new BLM staff sought to revitalize a process that had waned significantly in 2007. Even then, activity was limited. Interviews suggest that a general narrative had emerged about the PAWG that it "was a complete failure," and some in the SETG would likely agree with one member's blunt observation that "we didn't do shit!" These negative perceptions focus on the absence of action on the part of the BLM to intervene to address socioeconomic impacts,

either through amendments to planned activities or through direct engagement with socioeconomic mitigation. However, the process did lead to multiple important outcomes.

The collective nature of early report writing created a genuine opportunity for social learning about impacts, about local government function. At the same time, citizen volunteers were soon experts in the challenges in socioeconomic monitoring. Task group members were overwhelmed by the taxing nature of collecting primary data. Their discussions about how to measure "connectiveness" and quality of life reflected a growing appreciation for the challenges of collecting accurate data on public opinion. Altogether, this level of engagement with local socioeconomic data and local government function educated a small cohort of engaged citizens to the potential benefit of future planning and public processes.

But clearly, fatigue and frustration were also key outcomes of the process as the following quotations collected in interviews with three different participants suggest.

> When we started building the report, there was a lot of volunteer work involved in putting that together. Folks came in, they were interested, they wanted to be involved at the ground level. They didn't anticipate—some were driving up from Rock Springs—big personal commitment. I don't think they anticipated that the commitment would be that much, that much of a demand on their time.

> I think everybody was very frustrated with the whole PAWG concept. There were so many things based on the ROD [the Record of Decision and its stipulated process] that could not be entered in. Getting members appointed and having to go through the whole federal process to do that was … it just did not work well. People were spending an inordinate amount of time on a lot of things and nothing ever seemed to evolve from it.

> That was the defining narrative of my time there--[the] BLM not wanting to use that information, to not want to engage with socioeconomic impacts. According to the BLM, the impacts were off-site, which means that they did not have to mitigate them. But it was clear [to] everyone they could have, if they had wanted to, made a case for mitigating them or for requiring mitigation.

The process had important practical outcomes: it created a plan and momentum for an explicit effort to collect and analyze data and coordinate mitigation at the local level. It led

to a three-year professional position focused exclusively on socioeconomic data. This data was valuable to local elected officials and staff in a variety of ways. For example, this process provided data on projected population growth to school districts. In addition, it institutionalized the practice of requesting drilling forecasts from industry and providing an aggregate 10-year drilling forecast to local governments for the purposes of mitigation and planning.

Since 2007, the BLM has taken responsibility for aggregating and disseminating drilling forecasts on an annual basis, within the confines of development in the Pinedale Anticline Project Area. The agency organizes an annual "Air, Water, Socioeconomic Annual Planning Meeting" that serves as a forum for dialogue between industry, the federal agencies, and local government. In the 2013 update, the drilling forecast report included information about producing wells, rig efficiency rates, and the number of employees (directly employed by the major drilling companies) working in the area (U.S. BLM, 2013). Given that the data are speculative, the greatest benefit of this effort may ultimately be the structured opportunity for local governments to interact with industry about their plans. As one local government official interviewed for this research observed:

> The information is helpful for planning, but what has probably more impact on how many wells the BLM drills in a year versus how many rigs they have working… is the price of gas, … But it always helpful to have these planning meetings to where industry will tell BLM that under this scenario this is what we're looking [at]. It has helped all of us, although bottom line for county planning is going to be: What does next year's budget look like? That's easier to get a handle on that than to try to guess what we'll have [in] 10 years.

3.1 SCP: Design and goals

Socioeconomic monitoring continued with the formal establishment of the Sublette Community Partnership in 2006, and under this arrangement, mitigation action on socioeconomic concerns took a major step forward. According to a county commissioner involved with the establishment of the group, the group reacted to the stalemate at the PAWG by focusing on what could be done and who could get it done:

> Three of us sitting around, we got our heads together and formulated this plan. The county commission was on board. Five of the major industry players were on board for it. All of the mayors of the three communities thought it was a good idea too. If everybody could sit down at the same table, voice our frustrations, maybe look for some solutions, maybe we could get something done.

The SCP focused on practical solutions. According to a press release by the group, "[t]he mission of the organization is to prioritize and facilitate the implementation of community development projects and activities as identified by various locally-initiated needs studies and surveys" (Turner, 2007).

The SCP was organized to include decision-makers and industry. It was not designed to be a process for citizens to vent concerns about oil and gas development, but rather a forum for local government and industry to communicate and act on priority, tractable concerns. One of the group's founding members, who went on to coordinate the group, had been working as the assistant to the mayor of Pinedale. The SCP had a three-year charter and was funded with minimal contributions from each municipality, the county, and industry. Membership on the advisory board was limited to representatives of each of these entities. As a lead county commissioner put it, "our expectation was that community concerns would boil up" through officials participating in the SCP.

An integral strategy was to focus on building trust and cooperation among discrete local governments in the county. There were a couple of dimensions to the need for trust, according to one informant: a decades-long history of competition between the southern and northern parts of the county and bad feelings that had built up as a result of the ineffectiveness of the PAWG. In an interview, the project coordinator described the legacy of the PAWG SETG developments this way:

> I think everybody just kind of gets back in their little corner. I think BLM gets in their corner. The town got in their corner, you know, the companies got in their corner. The environmental community got in their corner. I mean this idea of civility in conversation about getting to the point where you can have a reasonable resolution to issues is something that we need to continue to work on.

Industry saw the benefits in a local government-endorsed entity that could help them direct private funding to beneficial uses. Because the SCP had legitimacy with local

leaders, industry representatives could be confident that their efforts and participation would not only accomplish practical goals, but also would help create goodwill with key community leaders.

During the three-year history of the partnership, the basic model involved monthly meetings of the board, over dinner—an important way to keep attendance up and create a spirit of cooperation—to discuss SCP ongoing and future activities. SCP was largely involved with conversations between the coordinator, the socioeconomic analyst, and the representatives of communities and the companies to act on priority concerns. The SCP coordinator took direction from the board, but also presented ideas to the board for SCP activities.

3.2 SCP: Major activities

While the SCP grew to be a multipurpose, community development-focused entity, its early function was to acquire funding for community development priorities—funding that some had anticipated would emerge as mitigation funding from the federal adaptive management process. When it became clear that the PAWG process would not produce this outcome, the SCP emerged as an important facilitator of grant applications by local governments to Wyoming's state fund for infrastructure support. In this way, the transition from the SETG and PAWG process to the SCP model can be read as a shift from an ambitious program to link monitoring, mitigation, and adaptive management under federal planning mechanisms to a more standard version of energy impact response. That is, the SCP exemplifies the common scenario discussed in Section 2 in which impact mitigation across energy development areas occurs through local initiatives scrambling to identify one-off funding sources to make up for revenue shortfalls.

The SCP had access to data and reports developed by the socioeconomic analyst on topics originally identified by the SETG, such as a workforce housing survey, wage and employment surveys, and updates on housing and real estate trends. In addition the analyst conducted surveys focused on SCP priorities including childcare needs, a recreational center, and vocational education. In 2008, the analyst completed the survey on

quality of life first anticipated by members of the SETG in 2004. Over the course of the existence of the socioeconomic analyst position, from mid-2005 through 2009, research reports were developed that addressed all of the issues originally identified by the SETG and the analyst was integral in community outreach efforts related to the SCP.

Later, activities focused on a workforce training program, an afterschool program, and a plan for a community recreational center in the southern part of the county. The SCP also took on one-off educational events like a public forum focused on ozone and air quality concerns. In one report to the board, the coordinator shared information about a public health program focused on flu prevention. Its flagship activities after the original infrastructure grants, however, were developing funding and implementing a childcare and afterschool program, and working with industry to address gas field workforce issues including training, housing, and substance abuse.

Professional representation

A related development closely linked to the corpus of data and analysis produced by the socioeconomic analyst was the county's decision to hire professional consultants to represent them in federal land use planning matters. Montana-based Ecosystem Research Group began working for the county in 2006, supported by the state's FNRPA funds. In addition to representing the county in many federal planning venues, the group was tasked with coordinating a major report based on collected data. The group produced a two-volume report cataloging all of the major impacts in the county, with a focus on identifying costs of impacts and revenue shortfalls affecting local governments (Ecosystem Research Group, 2009). Data gathered under the auspices of SETG and SCP were at the core of these reports. Summarizing the findings of this report, local governments collaborated on a 2009 letter to the governor that noted that Sublette County and its municipalities between 2004 and 2008 had invested $69.2 million in infrastructure improvements, of which the state contributed $15 million. Of the remaining priority infrastructure improvements that would cost $71.1 million, local governments indicated they could afford to cover only a small share of the cost. While supporting documentation was hard to refute, the timing of the request was early in 2009 just as the global economic

recession brought drilling to halt and (temporarily) slowed the state's energy-related flow of revenue. A specific appropriation from the legislature to address revenue shortfalls did not materialize for Sublette County.

3.3 SCP: Outcomes

At the end of the three-year charter for the Sublette Community Partnership in 2009, the charter was not renewed and the organization no longer exists. When asked to reflect on the ultimate value of the SCP efforts, respondents interviewed for this study focused primarily on the value of the data collected, the concrete accomplishments in building facilities and services, and the development of a positive working relationship among local governments and between local government and industry. One elected official noted that "[o]ne of the bigger purposes of the report was it gave us a whole lot better understanding of impacts." The commissioner had testified in front of the state legislature in favor of a one-time appropriation of support to local governments in a different part of the state that anticipated an oil boom. He noted that the summary report was critical to an effective argument to the legislature. Reflecting on the Sublette County experience, he observed, "We didn't have the money up front and didn't realize that we might have gotten a one-time appropriation."

Indeed, one change several interviewees would have made was to start all of these efforts earlier. As the SCP coordinator put it:

> …we should have done [a socioeconomic monitoring program] in about 1992, probably. If we had started documenting what was going on in this county back then, we would have been able to have had better projections and, as the companies came in, and at that time—I mean, they still donate to a myriad of things in the community but, at that time, of course, they were coming in and they were going, "Wow, we really want to help this community." If we had had documentation about what we needed at that point, we would have been much more successful in our endeavors in forming relationships and partnerships with the companies early on, when there was probably a heck of a lot more money available to plunge into the community because you're coming in and you're new and you want to be a part of the community.

The data helped local governments articulate their cases in other ways. Focused as it was on facilitating community projects, the SCP did not engage directly in federal planning processes. However, because the socioeconomic analyst continued to produce data and analysis, local governments and other concerned local institutions could utilize the information to support their submissions. For example, the Town of Pinedale benefitted from the data and analysis to make their concerns about intensified drilling under the 2008 SEIS [Supplemental Environmental Impact Statement] known. Regarding the Draft Environmental Impact Statement in 2007, comments submitted by the Pinedale Town Council, using metrics developed by the analyst and town anecdotes to support its assessment, observed that the BLM planning document severely underestimated social and economic impacts..[8] Sublette County Commissioners also included detailed comments developed by the socioeconomic analyst in its submission on the SEIS. (Lankford, 2007).

In addition, the SCP offered a positive working space during a period when community dynamics were often very fraught. The can-do, practical orientation of the SCP reflected a very different purpose from the original SETG. The SCP was not focused in any way on shaping the pace and scale of development. One interviewee described a difference between the SETG and the SCP: "With the SETG there was a lot of turnover, enthusiasm was waning. Discussion would be adrift. Whereas in the SCP people came and were engaged, focused, businesslike." Reflecting at the end of the process, the coordinator noted the positive social interactions: "we've gotten to be fairly good friends, all of us. I mean, we worked together a lot. There was a sense of comfort that I think expanded the potential for communication and that was a good thing …. It was a very bright, articulate group of people that really tried to figure out how to make the county a better place, and a

---

[8] The Town encouraged the agency to consider staged, or phased development:

> By slowing down, or staging development, our community would be better able to handle the socioeconomic impacts that we have been struggling with for several years now. By phasing-in development, the pace would be slowed down to a more manageable level, allowing for better social and economic responses by our community. (McKeever, 2007).

novel idea." Certainly the configuration of the partnership and its close focus on targeting feasible activities and making them happen contributed to its success. Where the SETG challenged oil and gas activity, the SCP sought to bring resources to community-identified issues, many of them oil and gas-related, but not exclusively.

4. Conclusions and Lessons Learned

Significant socioeconomic risks are associated with dependence on extractive industries. Rural communities that experience or anticipate HVHF activity face real challenges in charting a path away from a resource curse and toward long-term prosperity. This paper has observed an absence of formal socioeconomic impact assessment, monitoring, and mitigation programs at the state level in several major HVHF development areas in the U.S., and real deficiencies in such programs at the federal level. In the face of this absence, local innovations have great importance. The analysis presented here, of one rural community's efforts to implement socioeconomic impact monitoring and mitigation, leads to several important conclusions.

The first phase of local monitoring of socioeconomic developments occurred in an ambitious, but flawed federal adaptive management process. All was not lost with the failure of the PAWG to effectively implement adaptive management, but much was. This analysis does not detail the major loss of social and political capital by the agency as a result of the PAWG's failings. However, it has noted that the PAWG created a divisive working space which local governments had to overcome before they effectively could move forward. On the other hand, the PAWG initiated a citizen-led process of developing socioeconomic data that later engendered empowered responses by local governments with limited resources. As indicated by the section of this paper devoted to demonstrating how few coordinated efforts exist to collect socioeconomic impact data, let alone monitor change over time or mitigate impacts, the employment of a local socioeconomic analyst and the later deployment of data collected by local governments were substantial

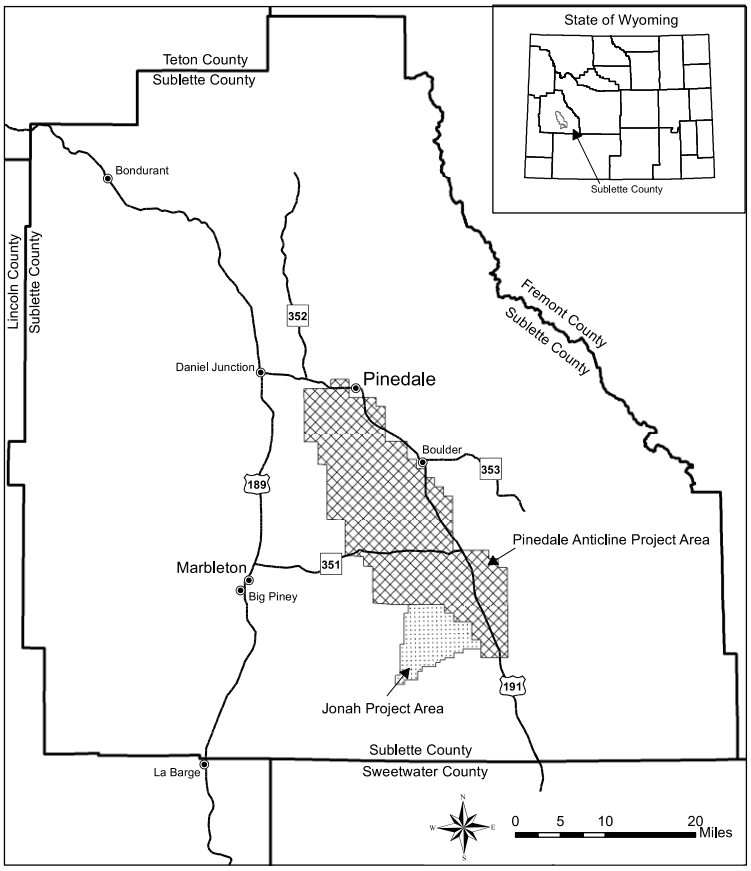
accomplishments. This command of data and analysis might not have occurred without the impetus of the federal PAWG process.

As executed, the SCP has much to offer as a template for a solution for rural places with limited local government resources. In addition to sharing data collection and analysis services, the SCP featured a coordinator who could link the monitoring information coming in to a group with the political capital to recruit support for development projects from key players such as local governments, state government, industry, and private funders. In this way, the SCP had the institutional design to be effective in regard to *post-facto* impact mitigation. However, it was the SETG as originally designed that promised genuine adaptive management.

Most of all, these two processes reflect the imperfect and troubling nature of current governance of HVHF development in the United States. Where one federal agency attempted (in at least this one case) to implement adaptive management to address environmental as well as social impacts of large-scale HVHF, it failed. And while other innovative local governance solutions likely will emerge, they are apt to share common challenges with the SCP. They will devote their energies to identifying funding to make up for shortcomings in the revenue policies, will operate for a short time during crises, and their local, organic nature will make it difficult to leverage the institutional knowledge, and social and political capital they gain, to other developments.

As a result, rural community after rural community may be left re-inventing the wheel of socioeconomic impact monitoring and mitigation. It is unlikely that this offers a hopeful set of outcomes when it comes to navigating the risks of the resource curse as a function of hosting HVHF activities. Many other aspects of community and environmental impacts from HVHF have engendered local monitoring responses, along with *ad hoc* mitigation programs. Future research that considers the outcomes of these approaches from a variety of perspectives will be important to developing a complete assessment of the opportunities and challenges inherent in a state and local approach to monitoring industrial development.

Figure 1. Area Map



Map by Logan Jackson.

Figure 2. Task Group Functions According to 2000 PAPA EIS.

Task Group Functions. During the public meeting held in Pinedale within two months of the issuance of the Pinedale Anticline ROD, separate resource or activity *Task Groups* (*TGs*) will be established. The primary function of the *TGs* will be to complete the following:

- Prepare and oversee implementation of specified resource/activity monitoring plans;
- Keep written record of meetings and disseminate to members and interested public;
- For the second AEM meeting (February 2001), *TGs* will:
  - Prepare monitoring plan to include the following:
    1. Implementation protocol including who in industry will fund and conduct monitoring;
    2. Annual monitoring report requirements and meeting frequency;
    3. Resource concerns (e.g., based upon current conditions, drilling plans, etc.);
    4. To aid in the preparation of the monitoring plan and for evaluation of monitoring results, review, evaluate and summarize past/present data pertaining to the resource;
    5. Annual survey/inventory, monitoring, etc. that needs to be completed;
    6. Resource protection/mitigation measures for resource as identified in the ROD;
    7. Evaluation of mitigation measure(s) effectiveness;
    8. Results of monitoring and evaluation of the effect of project development on the resource;
- For subsequent meetings the *TGs* will:
  - Be responsible for overseeing the accomplishment of the following:
    1. Implement monitoring plan as approved by BLM;
    2. Review and evaluate monitoring data collected;
    3. Present and submit monitoring results annually to *PAWG* and BLM;
    4. Review and evaluate current monitoring plan;
    5. Modify monitoring plan and implement as approved by BLM;
    6. Recommend modifications to the development and monitoring plan to the *PAWG* and BLM;
    7. Recommend modification to mitigation as needed.

Source: BLM, 2000. "Draft Adaptive Management Planning Process for the Pinedale Anticline Project Area." Appendix C to Pinedale Anticline Final Environmental Impact Statement.

REFERENCES

American Heritage Center. (2010). Wyoming's Energy Booms and Busts: Sublette County. Web site and oral history collection: http://www.uwyo.edu/ahc/energyboom/index.htm.

Benson, M.H. (2009). Integrating Adaptive Management and Oil and Gas Development: Existing Obstacles and Opportunities for Reform. *Environmental Law Reporter* 39(10): 10962-10978.

Burdge, B.J. (2002). Why is social impact assessment the orphan of the assessment process? *Impact Assessment and Project Appraisal* 20(1): 3-9.

Center for Rural Pennsylvania. (2014.) Current Grant Projects. Web page: http://www.rural.palegislature.us/grants_current_projects.html.

Citizens for Pennsylvania's Future. (2012). Pennsylvania's New Oil and Gas Law (Act 13): A Plain Language Guide and Analysis, Version 1.2. Retrieved from: http://pennfuture.org/UserFiles/File/MineDrill/Marcellus/CitizenGuide_Act13_2012.pdf.

Copeland, H.E., et al. (2009). Mapping oil and gas development potential in the US Intermountain West and estimating impacts to species. *PLoS One* 4(10): e7400.

Ecosystem Research Group. (2009). Sublette County Socioeconomic Impact Study. Phase II—Final Report. Prepared for Sublette County Commission. Retrieved online: http://www.sublettewyo.com/DocumentCenter/Home/View/392.

Freudenburg, W.R. (1992). Addictive Economies: Extractive Industries and Vulnerable Localities in a Changing World Economy. *Rural Sociology* 57(3): 305–332.

Freudenburg, W.R. & L.J. Wilson. (2002). Mining the Data: Analyzing the Economic Implications of Mining for Nonmetropolitan Regions. *Sociological Inquiry* 72(4): 549–575.

Fuller, A. (2007, February 5). Boomtown Blues: How natural gas changed the way of life in Sublette County. *New Yorker Magazine*: 38-45.

Gulliford, A. (2003). *Boomtown Blues: Colorado Oil Shale.* Revised Edition. Boulder: Univ. of Colorado Press.

Haggerty, J.H., P.H. Gude, M. Delorey, and R. Rasker. (In press). Long-term effects of income specialization in oil and gas extraction: the U.S. West, 1980-2011. *Energy Economics*. Unpublished manuscript available online: http://headwaterseconomics.org/energy/western/western-counties-fossil-fuel-development.

Haggerty M.N. & J.H. Haggerty. (Forthcoming). "Energy Development as Opportunity and Challenge in the Rural West." Invited chapter in *The Rural West: Common Regional Issues*. David Danbom, editor. University of Utah Press.

Headwaters Economics. (2011). Fossil Fuel Extraction and Western Economies. Bozeman, MT: Headwaters Economics. Retrieved from: http://headwaterseconomics.org/wphw/wp-content/uploads/Fossilfuel_West_Report.pdf.

Huntington, R. (2008, Nov. 21). Stuck in the PAWGmire. *High Country News*. Retrieved from: https://www.hcn.org/issues/40.21/stuck-in-the-pawgmire.

Jacquet, J.B. (2014a). "Review of Risks to Communities from Shale Energy Development." *Environmental Science and Technology*. Article ASAP. Retrieved online.

Jacquet, J.B. (2014b). "A Short History of Social Impact Assessment." Published by Headwaters Economics, Bozeman, MT.

Jacquet, J.B. & D.L. Kay. (2014). The unconventional boomtown: Updating the impact model to fit new spatial and temporal scales. *Journal of Rural and Community Development* 9(1): 1-23.

Jacobsen, G.D. & D.C. Parker. (Forthcoming). The Economic Aftermath of Resource Booms: Evidence from Boomtowns in the American West. *Economic Journal*. Retrieved from: http://grantjacobson.com/Booms.pdf/.

James, A. & D. Aadland. (2011). "The Curse of Natural Resources: An Empirical Investigation of U.S. Counties." *Resource and Energy Economics* 33 (2): 440–453.

Lankford, M. (2007, Apr. 6). Supplemental Comments from Sublette County regarding Pinedale Anticline Draft SEIS. Retrieved from: http://www.blm.gov/wy/st/en/info/NEPA/documents/pfo/anticline/draftcomments.html.

McKeever, L. (2007, Apr. 5). Comments from Town of Pinedale regarding Pinedale Anticline Draft SEIS. Retrieved from: http://www.blm.gov/pgdata/etc/medialib/blm/wy/information/NEPA/pfodocs/anticline/dr-comments/la.Par.2872.File.dat/6-TownPinedale.pdf 6/9/2014.

Miller, S. (2007, Oct. 19). "Sublette Community Partnership has civic leaders, energy representatives addressing issues." *University of Wyoming Extension* web site: http://www.wyomingextension.org/news/2007/10/19/sublette-community-partnership-has-civic-leaders-energy-representatives-addressing-issues/.

Montana Department of Commerce. (no date). Eastern Montana Technical Assistance. Web page: http://comdev.mt.gov/CTAP/emttechnicalassistance.mcpx.

Noble, A.C. (2011). The Jonah Field and Pinedale Anticline: A natural-gas success story. Online essay: http://www.wyohistory.org/essays/jonah-field-and-pinedale-anticline-natural-gas-success-story?page=2.

North Dakota Energy Infrastructure and Impact Office. (2014, Feb. 27). Energy Infrastructure and Impact Office Grant Application. Retrieved from: http://land.nd.gov/Docs/EnergyImpact/Round%204%20Application.pdf.

Oldham, J. (2012, Feb. 2). "North Dakota's Oil Boom Strains its Infrastructure." *Bloomberg Businessweek Magazine*. Retrieved from: http://www.businessweek.com/magazine/north-dakotas-oil-boom-strains-its-infrastructure-02022012.html.

Papyrakis, E., & Gerlagh, R. (2007). Resource abundance and economic growth in the United States. *European Economic Review*, *51*(4), 1011-1039.

Pennsylvania Department of Environmental Protection. (2014). "Marcellus Shale Advisory Coalition" web page: http://www.portal.state.pa.us/portal/server.pt/community/marcellus_shale_advisory_commission/20074.

Rabe, G. (2014). Shale Play Politics: The Intergovernmental Odyssey of American Shale Governance. *Environmental Science and Technology.* Articles ASAP, retrieved online.

Stedman, R. (2014). "The Reification Trap or 'Following the Data Around'—Resilience and the Sustainability Hangover." Presentation at Resilience 2014, Third International Science and Policy Conference. May 4-8, 2014. Montpellier, France.

Turner, T. (2007, Sept. 20). Partnership Forms to Aid Countywide Impacts. *Sublette Examiner.* Retrieved from http://www.sublette.com/examiner/v7n26/v7n26s4.htm on 6/9/2014.

U.S. Bureau of Land Management (BLM). (2000). "Draft Adaptive Management Planning Process for the Pinedale Anticline Project Area." Appendix C retrieved online: (http://www.blm.gov/pgdata/etc/medialib/blm/wy/information/NEPA/pfodocs/anticline.Par.6236.File.dat/017app-c.pdf)

U.S. Bureau of Land Management (BLM). (2013). "2013 Pinedale Anticline Socioeconomic Considerations Ultra, Shell and QEP (USQ)." PowerPoint presentation to Aug. 20, 2013 Air, Water, Socioeconomic Annual Planning Meeting. Retrieved from: http://www.blm.gov/pgdata/etc/medialib/blm/wy/field-offices/pinedale/papadocs/apm_air_water_socio.Par.49770.File.dat/PAPADrill.pdf

U.S. Bureau of Land Management (BLM), Pinedale Anticline Working Group (PAWG) (2004, Jul. 12). Meeting Minutes. Retrieved from: http://www.blm.gov/pgdata/etc/medialib/blm/wy/field-offices/pinedale/pawg/2004.Par.5500.File.dat/pawg07-12.pdf.

U.S. Bureau of Land Management (BLM), Pinedale Anticline Working Group (PAWG), (2005a, Apr. 22). Meeting Minutes. Retrieved from: http://www.blm.gov/pgdata/etc/medialib/blm/wy/field-offices/pinedale/pawg/2005.Par.90590.File.dat/pawg0422.pdf.

U.S. Bureau of Land Management (BLM), Pinedale Anticline Working Group (PAWG), (2005b, May 19). Meeting Minutes. Retrieved from: http://www.blm.gov/pgdata/etc/medialib/blm/wy/field-offices/pinedale/pawg/2005.Par.7646.File.dat/pawg0519.pdf.

U.S. Bureau of Land Management (BLM), Pinedale Anticline Working Group (PAWG), Socioeconomic Task Group (SETG). (2004, Oct. 27). Meeting Minutes. Retrieved online: http://www.blm.gov/pgdata/etc/medialib/blm/wy/field-offices/pinedale/pawg/2004.Par.4587.File.dat/socioecon10-27.pdf.

U.S. Bureau of Land Management (BLM), Pinedale Anticline Working Group (PAWG), Socioeconomic Task Group (SETG). (2005, Apr.). "Report & Monitoring Plan." Report to Pinedale Anticline Working Group. Retrieved online: http://www.blm.gov/pgdata/etc/medialib/blm/wy/field-offices/pinedale/pawg/2005.Par.31765.File.dat/2005SocioRpt.pdf.

U.S. Bureau of Land Management (BLM), Pinedale Anticline Working Group (PAWG), Socioeconomic Task Group (SETG). (2006a, Mar.). "DRAFT Monitoring Plan & Report." Report to Pinedale Anticline Working Group. Manuscript in author's possession.

U.S. Bureau of Land Management (BLM), Pinedale Anticline Working Group (PAWG), Socioeconomic Task Group (SETG). (2006b, May 15). Sublette County Socioeconomic Roundtable – DRAFT meeting summary. Retrieved from: http://www.blm.gov/pgdata/etc/medialib/blm/wy/field-offices/pinedale/pawg/2006.Par.13907.File.dat/05-15-06SocioMinutes.pdf

Vengosh, A. et. al. (2014). A Critical Review of the Risks to Water Resources from Unconventional Shale Gas Development and Hydraulic Fracturing in the United States. *Environmental Science and Technology.* Article ASAP. Retrieved online.

Walker, B.L., D.E. Naugle, and K.E. Doherty. (2007). Greater sage-grouse population response to energy development and habitat loss. *The Journal of Wildlife Management* 71(8): 2644-2654.

Weber, J.G. 2013. "A Decade of Natural Gas Development: The Makings of a Resource Curse?" *Resource and Energy Economics*, in press (corrected proof available online).