Energy Boomtowns & Natural Gas:
Implications for Marcellus Shale Local Governments & Rural Communities

NERCRD Rural Development Paper No. 43
January 2009, 63 pp.

Prepared by Jeffrey Jacquet

The Northeast Regional Center for Rural Development
The Pennsylvania State University

7 Armsby Building, University Park PA 16802-5602
814/863-4656(phone); 814/863-0586(fax)
nercrd@psu.edu | www.nercrd.psu.edu

Cornell University

PENNSTATE
1855

Table of Contents:

Table of Figures:

Introduction & Executive Summary

The Marcellus Shale Natural Gas Reserve located in the Northern Appalachia region of the Northeast United States holds a great potential for wide-scale natural gas development. As of 2009, development of the Marcellus Shale is in preliminary stages; however, the social and economic implications of large-scale development on the region's patchwork of rural communities and small towns are currently being considered by state and local officials, researchers, and citizens in the region.

Energy Boomtowns

The impacts of energy extraction on small towns were extensively studied during the 1970s and 1980s, when rural areas of the western United States underwent a period of significant energy development. While more than 25 years old, these stuides represent the most recent wide-scale analysis on the effects of energy development in the United States. A number of social and economic trends emerged from this work and a so-called "*Boomtown Impact Model*" took shape among researchers studying the development in these rural communities. The model posits that rural communities are often overwhelmed by rapid population influxes associated with the energy development and that energy development often provides a number of unique opportunities and challenges to communities and local governments.

Local governments are often caught unprepared by the waves of new growth and are at a dis-

advantage to mitigate potential growth problems. Some of these disatvantages include a lack of information, growth volatility, lack of jurisdiction, conflict between long-term residents and new residents, resistance to new government policy or planning strategies, shortage of staff or expertise, and a lack of or lag in sufficent revenue. Boomtown research has shown that *economic impacts* can be mixed, as some sectors or communities will benefit much more than others. Businesses or residents not directly tied to the energy industry may have to deal with inflationary or employment pressures while not seeing gains in revenue. Job growth can be stratified, as while new jobs will be created, not all workers will be suited for or interested in these jobs. Expectations for economic benefits are often unrealistically high, and while economic and job growth does occur, these expectations are not met. A significant body of literature shows that boomtowns can harbor disproportinate increases in social problems such as crime, mental health problems, community disatisfaction, education shortfalls, and other indicators. Research shows that certain groups of people will have different social reactions to rapid growth, depending on their stature in the community and whether they were residents before the growth occurred.

Natural Gas

In addition to this prior boomtown research, Natural Gas developments that are similar in scope to the Marcellus Shale are currently underway in the western United States in places such as Wyoming, Colorado, and Texas. Evidence from the case study of Sublette County, Wyoming is presented here that shows natural gas drilling today can produce many of the same effects as are outlined in the boomtown model, at least provided that the impacted community is sufficiently small. The natural gas drilling process requires substantial populations of transient workforces as well as resident workforces that put strains on housing and government services. Inflation and other cost of living pressures in Sublette County appear similar to pressures described in the classic boomtown model, as is the realization of significant gains in job and economic growth for those persons able to participate in sectors related to the energy industry.

The Marcellus Shale

The Marcellus Shale region undoubtedly differs in many critical respects from the community experiences that form the Boomtown Model, as well as contemporary examples, especially in the areas of population size and distribution, transportation, history, and sheer size of the potential resource. However, there are also a large number of key similarities as the equipment, workforces, organization, and process used in the extraction of the natural gas remain nearly identical across the industry, and many communities in the Marcellus Shale region are sufficiently small and rural in that nearby large scale development would likely produce a number of similar effects as have been documented in other areas. It is most likely that the Marcellus Shale development will produce different effects on different areas, with community size and isolation as key factors that determine the effects . The Boomtown model and these examples can provide useful information when trying to assess and prepare for the positive and negative social and economic impacts that will likely be faced by communities in the Marcellus Shale region.

The histories suggest that Marcellus Shale communities need to take the current opportunity to form task forces to organize information and oversight structures in their communities. Such task forces can help to define providers of services, jurisdictions, and authorities among local governments and service providers while creating relationships with private sectors and energy companies. Communities need to define the historical patterns of service demand and identify capacities for growth, and then prepare mitigation strategies for when these thresholds are crossed. Perhaps most importantly, communities should prepare for the volatile nature of energy development and design long-term strategies that produce both short term mitigations and long term investments in their communities.

> *It is the goal of this paper to provide information that will assist officials, researchers, and citizens engaged in Marcellus Shale to better analyze and prepare for both the positive and negative impacts facing their communities. This paper is organized into three areas, (1) a compendium of summaries and prominent research on the Boomtown Impact Model, (2) a comprehensive overview of the contemporary example of natural gas drilling in the area of Sublette County, Wyoming, and (3) a discussion on the similarities and contrasts to, and some of the implications for, the Marcellus Shale region.*

Part One: The Boomtown Impact Model

The social and economic analysis of small communities undergoing rapid population growth and industrialization gained significant prominence during the 1970s and 1980s. During this time, the western United States underwent a period of heavy energy development as spikes in energy prices led to the implementation of hundreds of new energy projects across the west, including coal, uranium, oil, oil shale, trona, and natural gas extraction, as well as the construction of new coal-fired power plants, pipelines, and processing facilities. (Cortese and Jones 1978)

These energy projects were often located near rural and isolated communities that received waves of new workers associated with the development. The social and economic changes were a direct function of the population change, as these communities were ill-prepared or equipped to provide services to the new residents and effectively manage the growth (Albrecht 1978). By 1977, the Comptroller General of the United States identified 131 western communities as being impacted by energy development and 25 or more of these communities were identified by sociologists as "boomtowns" undergoing severe rates of population growth (Staats 1977; Cortese and Jones 1978). Prior to the 1970s, problems related to rapid population growth were not widely debated, but a combination of lurid newspaper articles, a widely-publicized sociological paper, and pleas for assistance from local governments in these western energy boomtowns helped to stoke interest in the topic among researchers (Freudenburg 1982; Brown et al 1989).

The Boomtown Narrative

The widely-publicized sociological paper was delivered in 1974 by Eldean Kohrs, a clinical psychologist working in the boomtown of Gillette, Wyoming. At a conference in Laramie, Kohrs colorfully described the social anomie resulting from life in the poorly planned and over-crowded booming community, introducing the term "Gillette Syndrome" to describe the conditions. While his research would later be criticized by prominent sociologists for poor methodology, the paper and its lexicography quickly received "fame and infamy" (Freudenburg 1982) among the national media and sociologists alike (Franklin 1974; Richards 1976; WSJ 1975; Peterson 1985; for criticisms see Thompson 1974; Wilkinson, et al 1982).

An excerpt oft-quoted from Kohrs 1974:

> *A housewife, after fighting mud, wind, inaccurate water and disposal systems, a crowded mobile home and muddy children all day, snaps at her husband as he returns from a 16-hour shift. He responds by heading downtown and spending the night at a bar drinking and trading stories with men from similar circumstances. This typical occurrence came to be called the "Gillette Syndrome".*
>
> *Divorce, tensions on children, emotional damage and alcoholism were the result. Children went to school in double shifts; hotels turned over linens in triple-shifts. Jails became crowded and police departments experienced frequent changes in personnel in the tradition of frontier justice. Out of frustration with the quality of living, it appeared that mayors shuttled in and out of office regardless of party like bobbins in a loom. Depression was rampant with suicide attempts at a rate of one per 250 people. Suicide attempts were rarely fatal but they became the tool to regulate the lack of human concern. It was the ultimate method to express that something was wrong and needed changing.*

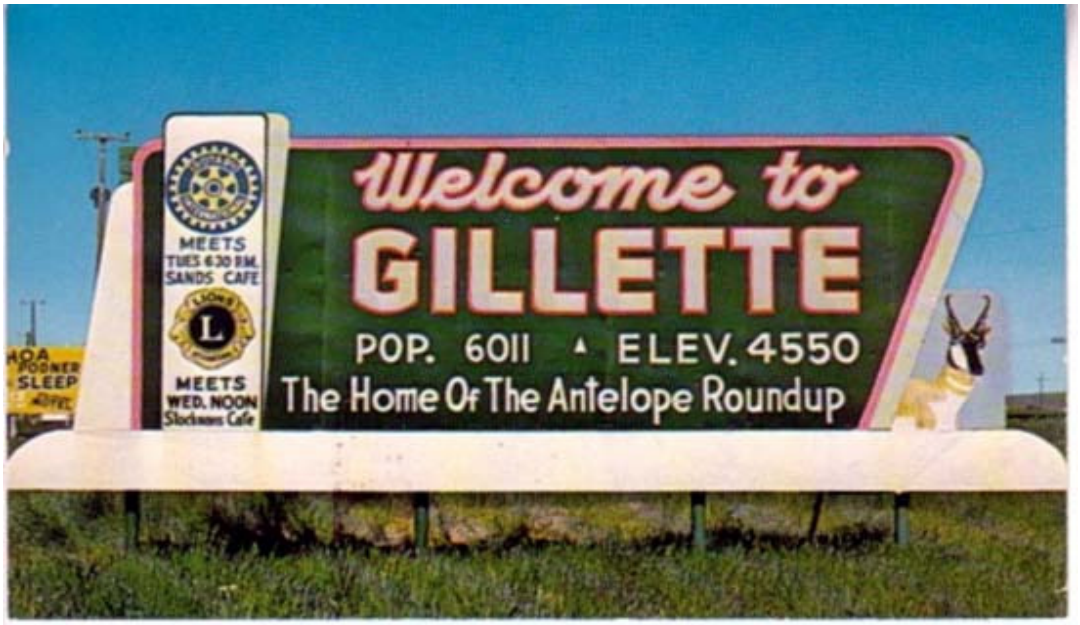


Figure 1: Gillette, Wyoming entrance sign, circa 1975. The town population would reach 12,134 by 1980.

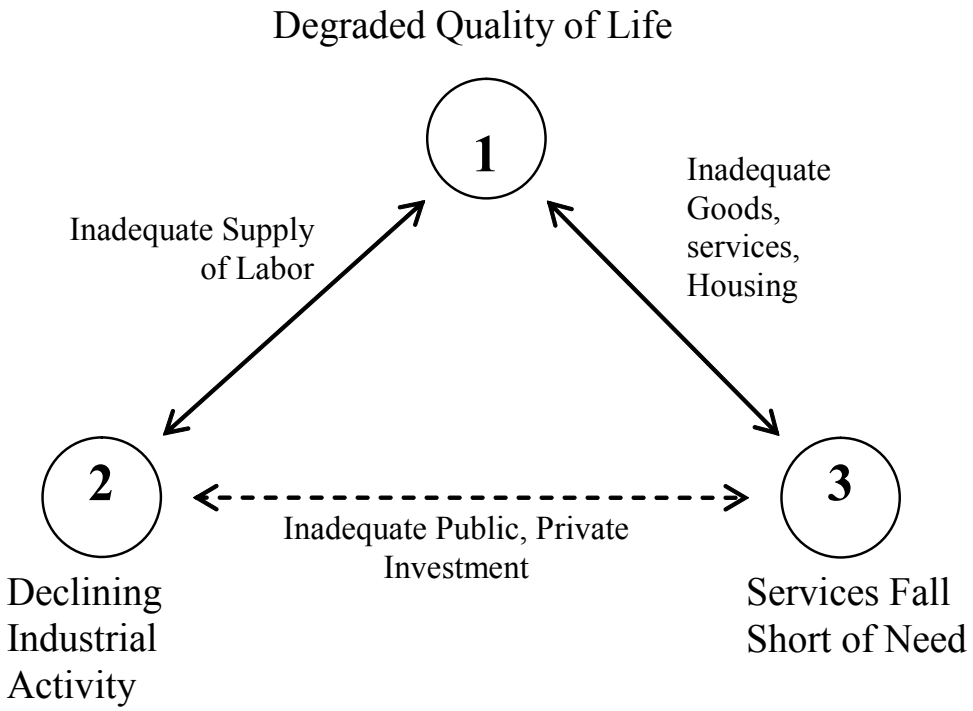
> *When neglect went beyond tolerable limits, divorce was the natural consequence. Fatigued men working long shifts and driving long distances to work came home to equally fatigued wives coping with a mud spattered world.*
>
> *Trailer courts offered only a mud patty for children's play as they raced between trailer houses and trailer court traffic. Even schools were in trailers similar to those in which the children lived. Nothing seemed permanent. Difficulty in coping with transient living, angry school personnel teaching under less than adequate conditions, and parental conflicts let to poor school adjustment and achievement, then truancy, then delinquency and finally a residential environment. (Kohrs 1974; Page 3)*

The study and the images it conjured were relayed around the world by national media, and social scientists became much more interested in the topic.

John S. Gilmore, in another widely-publicized article in the journal *Science* in 1976, outlined what Malamud (1984) later described as "the most coherent, thorough example of boomtown theory:"

As population grows at boom rates, existing local services fall short of need. School classrooms, retailing inventories, housing, and the number of physicians in the community do not grow as rapidly as the number of people increases. Many people's recreational requirements are not satisfied by the available opportunities. The quality of life in the community is degraded.

As a result, it is difficult to attract people to this isolated community which has no substantial indigenous labor force to service the economic growth. There is apt to be an inadequate supply of labor, which is unstable and dissatisfied at best. Workers and their families do not want to stay in the community and some of those who do stay are pirated back and forth among employers. Industrial employee turnover



Problem Triangle

Figure 2: Gilmore's Problem Triangle, Reproduced from Gilmore and Duff 1975.

rates and absenteeism go up rabidly. It is difficult to attract and retain a satisfactory work force, whether it is a workforce for building and operating a power plant or gasification plant, for operating a restaurant, or for maintaining the county's roads and bridges. Industrial productivity and profits drop.

Because of declining productivity, or at least the absence of expected increases in productivity and profits, there is less money coming in to support public sector activities. In addition, social malaise or chaos causes private investors to be skeptical and unwilling to invest in commercial facilities, housing, or the other private sector needs. Insurance companies even stop writing casualty coverage in the boom towns.

Thus the situation is back where it started in the problem triangle, with the local services and facilities finding it even harder to keep up with the increasing population and demand.

By the late 1970s, a so-called "boomtown model" or "social disruption model" emerged as a prominent framework among researchers to describe the rapid growth that overwhelms local governments and permanently alters social relationships. The body of evidence tended to find a mix of positive and negative economic impacts to local residents, contrasted with highly negative social impacts. (Markussen, 1978; Freudenburg 1984; Merrifield, J. 1984; Seyfrit 1988; Perdue, et al 1999).

Challenges to Local Governments

Markussen (1978) reoriented the social disruption model from a narrative of conditions to an emerging pattern of limitations faced by local governments. Seven key limitations were identified: a) *Jurisdictional unevenness*: The energy development prompting population growth takes place in a political jurisdiction different from the one which bears the cost. In such instances

the community bearing the brunt of the growth cannot control the development and may not receive mitigation funds because the development is elsewhere; b) *New Comers vs. Old Timers:* Rapid growth frequently requires major new infrastructure expenditures to accomodate new residents and older residents may oppose subsidizing such expendiures under uniform taxation arrangements. New residents may have substantially different expectations and preferences for levels of public service than older residents; c) *Insufficient control of land use*: decisions about disposition of land as in federal coal or offshore leasing prevents the local government from using zoning or siting arrangements to ease adjustment; d) *Severity of growth*: Sheer numbers of people entering to work, despite adequate housing, may be unassimilatable without significant declines in quality of public services and community life; e) *Volatile production patterns:* The boom-bust cycle associated with energy development presents the local government with an uneven future path of public service demand; f) *Monopoly of information:* the industry or regulatory agency exercises tremendous power over the pace of development and the amount of information that is available to planners; sometimes, an incentive to misinform exists; g) *Risk*.

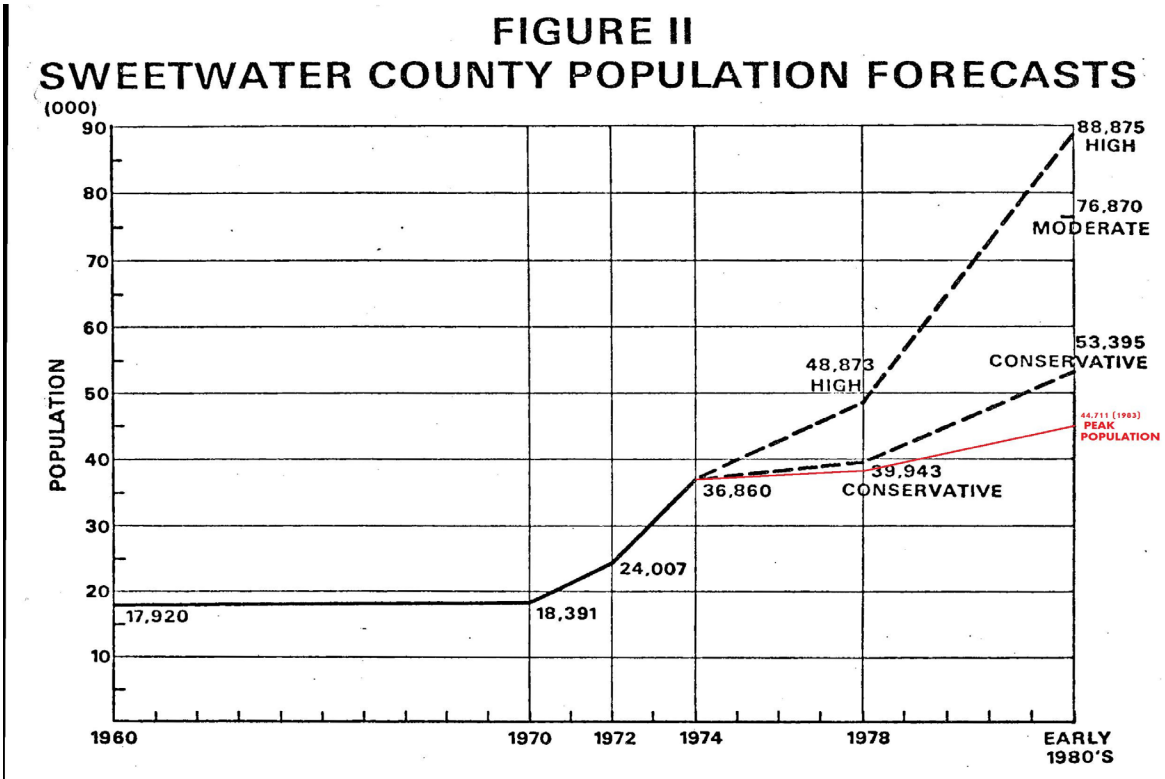


Figure 3: Gilmore and Duff's (1974) population projections for Sweetwater County, Wyoming Illustrate the difficulty in achieving accurate predictions under volatile circumstances. The actual population growth is illustrated in red.

The uncertainty surrounding the future of many energy activities raises the risk premium, often so high that the financial sector is unwilling to lend funds to or buy bonds of local governments.

Challenges to the Planning Process

Producing accurate population and growth projections for a community is recognized as an inexact science even under ideal circumstances; so trying to produce such projections under volatile high-growth circumstances with extremely poor data is another task entirely. Many times such projections undergo a high degree of resentment among local residents. Nevertheless, it is often these population projections upon which boomtown planning and investment must be based (Cummings and Mehr 1977). Oftentimes, energy development is dependent on volatile commodity prices or other economic factors, and development can stop or even quickly reverse on a moments notice, and the threat of overbuilding can further complicate planning efforts at the local level (For additional discussion, see "The Bust", page 21). In addition to growth uncertainty, local governments often face the brunt of the new service demand immediately after development occurs, yet additional revenue either does not arrive due to the taxation system or starts to flow several years after the impacts occur. (Ervin 1978).

Even if funding is available, local governments may be ill-equipped to effectively utilize such funds because of a combination of laws restricting the use of the funding, staff shortages or inexperience, lag-times involved in large capital facility construction, and the public unwillingness to change long-standing local policy. (Susskind and O'Hare 1977; Ervin 1978). Many rural areas historically have had little need for a highly educated and experienced planning staff, and quickly aquiring such a staff can be difficult and even controversial.

Growth Thresholds

There is not firm consensus on the growth threshold where governments become overwhelmed by new demand – and communities will react differently depending on the size of community,

capacity of infrastructure, and other factors. However, it is noted that rural communities as a group often have antiquated infrastructure facilities and governments unaccustomed to new demands (Little 1977). Gilmore (1976) has noted that towns can typically handle rates of 5% growth annually, and that rates in excess of 15% will lead to "institutional breakdowns in the labor market, the housing market, and the system for financing local public facilities". Kohrs is similarly on record as pointing to 6% annual growth, beyond which "things start to get out of hand" (Richards 1976). Ironically, many of these communities have been in search of economic and population growth mechanisms for decades and the boomtown growth represents "too much of what would otherwise be a good thing" (Freudenburg 1979).

Local Controversy

Residents and officials in rural communities are many times historically unaccustomed to making changes in local government policy and services, and when combined with growth uncertainty, such persons can become obstacles to changing policy in order to meet the needs of growing rural communities. Kassover and McKeown (1981) summarized five policy decisions for local governments that often face controversy: a) *Planning the location of growth*: do communities strive to locate new housing and economic development around the core existing communities or attempt to direct growth away from communities? b) *The use of lead time*. The amount of lead time and degree of commitment to social planning will determine the extent to which management programs are in place by the time they are needed. However, planning and policy changes during lead times can be even more controversial as residents may reject changes before the growth has yet to occur. c) *Preventive or reactive programs*: Advance planning can allow the implementation of preventive programming. However, boomtown experiences indicate that unless funding stipulations emphasize prevention efforts, available resources will be used almost exclusively for reactive programming. d)*The selection of a human impact planning organization*: Should the planning and advisory authority be vested in an organization external to government and industry? If so, how should that organization be comprised and its authority supported

and/or limited? Many residents may view such an outside organization as illegitimate or biased, and a governmental organization as corrupt. e) *The allocation of resources*: Who bears the cost of coping with human impacts; who determines appropriate expenditures; what is the process for negotiating responsibility?

Wenger (1978) observed that federal and state agencies can many times be of little help to rural areas as federal and state legislatures and administrations are most times beholden to the demand of constituents in more populated areas. He observed that the great philosophical debate among most politicians and managers is "those who benefit should pay" vs. "those who have the ability should pay".

Government and Community Reaction to Boomtown Growth

Gilmore (1976) outlined four stages of attitude that boomtown communities go through when dealing with population growth and industrialization. Freudenburg (1981) later found a number of similar stages when analyzing the social attitudes of boomtown men and women. Slightly modified, the four stages are: 1) *Enthusiasm* as officials and residents concentrate on the positive economic impacts of job growth and retail spending that are espoused by energy industry spokespeople, while the possible negative impacts are either unknown or are dismissed as unlikely in their specific area; 2) *Uncertainty*, as the town starts to change as new workers arrive in noticeable numbers. It is realized that some negative impacts have arrived along with the positive benefits, and that these negative impacts will likely grow. Officials begin to perform preliminary research; however, there are few resources or experienced staff to draw upon, while industry and state government claims there is nothing that can be done. Divisions emerge within the community as to whether the growth is detrimental or beneficial; 3) *Near Panic*, as the industrial activity and associated impacts grow much quicker than anticipated and the community character changes dramatically in the eyes of longer-term residents who become confused and angry at local officials and each other. Government services are overwhelmed and quality of services

declines while officials realize that any increase in revenues will not offset the expenditures in the near future or at all. Government officials find that they are ill-equipped, unprepared or do not have jurisdiction to make the necessary policy decisions while longer term residents feel new government polices are an affront to the community's historic way of life; and 4) *Adaptation*, as the core problems are eventually identified and planning/mitigation strategies are developed. Residents become solidified in their beliefs; however, they begin to accept the reality of the situation at hand. Residents and officials feel a sense of progress.

Malamund (1984) translates Gilmore's four steps into an unlikely whirlwind action plan for local governments: "[they] must, therefore, learn to plan, zone, negotiate with industry, evaluate different people's needs for compensation, fight for special state laws and for state and federal aid, work new local tax codes, and revamp their infrastructure and services. Local professionals must learn to work with new types of people. The local business structure either has to adjust to the newcomers or face insolvency." Alas, concludes Malamund, "The entire local power and service structure faces a huge task in dealing with boom conditions."

Massey and Davidson (1983) view the changes at the local government level as a process of Weberian *rationalization*, as governments provide new services, value expertise and experience, increase accountability, re-prioritize policy and expenditures among greater competing interests, and bureaucratize government systems. The authors argue that this process is necessary given the situation at hand and can be seen as desirable for local governments in the long run; however, the process will prove controversial among residents used to – and sometimes invested in – a more informal political structure.

Economic Impacts

The research on the economic impacts of boomtown growth varies significantly by individual project, and economic impacts have not been the priority of most boomtown social researchers. Economic impacts have been typically disclosed during Environmental Impact Statements as

part of the National Environmental Protection Act, although the accuracy of these are debated (Leistritz et al. 1982). However a number of overall trends have emerged that present the economic impacts as largely mixed (depending on the community, individuals, and sectors involved) and smaller than was originally assumed by community members.

The development will provide both a primary economic impact of new jobs, material purchases, taxes, and profits, as well as a secondary economic stimulus from providing goods and services to these new workers. Large development projects of any stripe have been found to provide a large economic stimulus to rural communities; however, as with other types of rural industrialization, a majority of the primary stimulus will leak out through the broader regional economy as the local community is not poised to provide the labor, materials, and services needed for rapid industrialization (Clemente 1975, Summers and Branch 1984; Ervin 1978). (For boomtown energy economics generally, see Leistritz et al. 1982).

Additionally, the employment, retail, and population impacts can vary dramatically from community-to-community even in a relatively small region. The larger and more established communities in the region of a major project will attract the largest population influx – even when smaller communities are geographically closer to the project site (Cortese 1979). Some research has shown it is the shorter-term development/construction workers that are more likely to take up residency in further-flung areas and face larger commuting times, while longer-term workers will seek residency closer to the work site (Wieland, et. al. 1977; 1979). The migratory nature of these construction workers has been the subject of some research. One survey of migratory workers found a number of variables that best expalin a construction worker's decision to seek permanent residence past the initial construction or development phase (in order of importance): time in the community, job security, age, housing integration, and satisfaction with community facilities and services (Fahys-Smith 1983).

Great lengths have been reached in trying to formulate economic models for energy development in rural areas, with the Los Alamos National Laboratory' Energy Systems and Economic Analysis Group producing several models including BOOM1, and BOOMP, and several researchers applying REAP and other models to the problem. For an summary of BOOM1, see Ford 1976; for an extensive review of all three (and more) see Markussen 1978 and Merrifield 1984). Most employ gravity models to predict the worker populations and the locations where they can be expected to take up residency - depending on the types of towns located in the region (Chalmers 1977; Cummings and Mehr 1977; Wieland, et. al. 1977; 1979). Suffice it to say, the models were met with limited success, at best.

Economic Expectations

Lovejoy and Little (1977; 1979) found that in many instances employment opportunities are ill-matched for local residents and employment gains may be, while moderate in real terms, far less than the expectations of residents and the promises made by developers. For example, a series of studies in the four-corners region found that the numbers of residents who indicated a desire to work in the energy industry was actually much smaller than the community expectations (Lovejoy and Little 1979). Many workers simply lack the requisite skills and are reluctant to be trained because the training period doesn't offer compensation or because they are uninterested in changing careers.

Lovejoy and Little (1979) outline the five principal assumptions that form the expectations that community members have towards energy development and employment opportunities: 1) rural residents will desire positions with the new industry; 2) a large number of locals will apply for the available jobs; 3) local applicants will possess the requisite job skills, 4) industry is willing and able to hire a substantial proportion of the local applicants, and 5) currently unemployed residents will desire, seek and obtain jobs with a greater frequency than those already employed. It is often the case that some if not all of these assumptions do not actually occur and the ba-

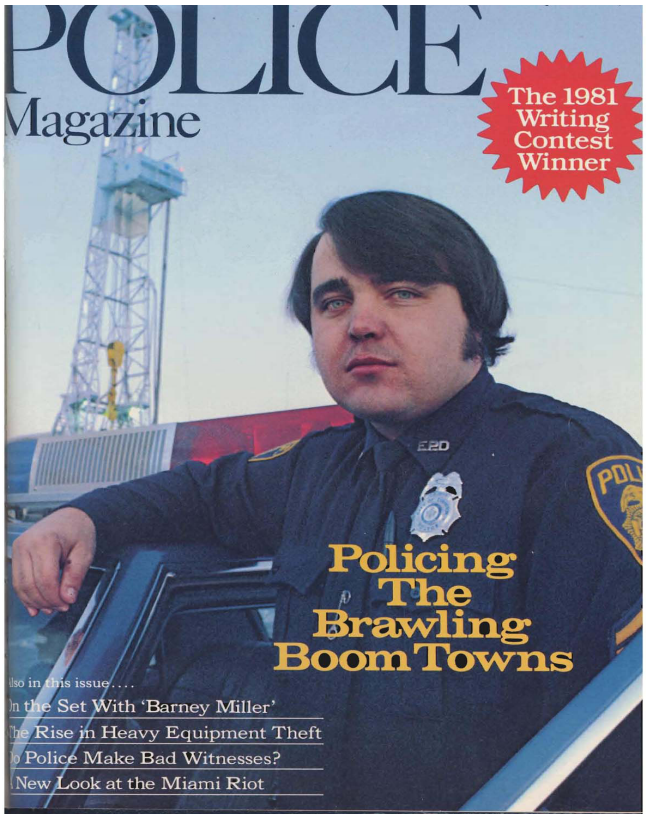


Figure 4: Crime in natural gas boomtowns was the topic of a 1981 Police Magazine *Cover Story.*

sis later appears unfounded (Lovejoy and Little 1979). In many cases, it is often the newcomers to a boomtown community who are often best skilled and experienced to take advantage of economic opportunities related to employment. A number of surveys have shown that newcomers show the largest incomes, mobility, and employment opportunities when compared to long-term residents; although long-term residents are no worse off than the long term residents of comparable non-impacted communities (Murdock and Schriner 1978). To that end, a number of studies on attitudes toward rural industrialization have shown that residents typically see the development as providing economic benefits both before and during the development, but that the level of perceived economic benefit drops once the development occurs (Thompson and Blevins 1983).

Furthermore, a mail survey of impacted and non-impacted communities in the northern Great Plains suggests that positive economic impacts are often overestimated among community members before development occurs while negative social impacts are often underestimated. The survey found that experience with energy development and expectations of positive economic impacts are inversely correlated among residents, while experience with energy development and expectations of negative social impacts are positively correlated. (Thompson and Blevins 1983).

Despite economic and labor leakages, and unfulfilled expectations, communities can overall ex-

pect rapid job growth and booming retail trade for businesses that cater to these new residents. While local business owners often receive greater sales activity, research is mixed on the extent businesses benefit from this activity. While receiving more economic activity, proprietors also have to fight high inflation rates, worker shortages, and changing ways of doing business (such as changing from a generalized "one of everything" store to specializing in large supplies of certain popular items) which may carry negative economic impacts during this transition period (Longbrake and Greyler 1979). Businesses may need to discontinue specialized services, offer poorer customer service, and pursue advertising campaigns due to increased demand and a changing clientele (Freudenburg 1982). The changes often will lead to a greater rate of turnover among ownership and an increased incentive to sell to outside interests. Research has found that the rate of failure among small businesses in boomtowns to be above the national average (Davidson 1979).

Some businesses detached in either geography or economic sector from the source of economic activity may not see revenue increase in a meaningful way, while the geographic isolation inherent in rural communities may affect each type of business differently (Longbrake and Greyler 1979). And as with job growth, while most businesses may ultimately receive greater profit margins, the profits often fall short of expectations (Freudenburg 1982).

Housing

A lack of housing in boomtown communities is often a critical problem, as existing housing fills up quickly and new housing takes years to materialize. In many cases, new housing creation is hampered by a number of factors, including high labor costs and shortages, high supply costs and shortages, as well as regulatory obstacles within local governments that are leery of permitting new developments that will further alter the community (Gilmore and Duff 1975). Simply housing the construction workers needed to build new housing is often a problem. One solution to this problem is often the addition of mobile homes, which can be controversial, as many

people find that mobile homes degrade the quality of life for inhabitants and the community as a whole. Research has shown that the majority of mobile home inhabitants in boomtown communities are newcomers (Massey and Lewis 1979).

Severe housing shortages will invariably lead to skyrocketing housing prices, which can have a significant benefit for existing residents who are willing or able to capitalize on this valuation by either selling their property or renting it. However, increased housing prices can provide a hardship for existing residents who are either not homeowners or plan to remain owner-occupiers of their property. Residents who are on a fixed income can be especially impacted as property taxes rise. Research has shown that severe shortages push housing prices well above the range of affordability for most energy workers (who in turn earn more than most existing residents) as housing builders focus on only the highest paid employees (Gilmore and Duff 1975). Another solution to severe housing shortages is often taking residency in other communities that have a lower cost of living but require significant commuting times to the energy site. The so-called "fringe-dwellers" have been shown in a study of the Gillette area to be less integrated in the community, participated less, and were less satisfied with their quality of life than residents inside the impacted community (Doran et. al. 1974; Gilmore and Duff 1975).

Attitudes toward Economic Impacts

Research is likewise mixed on whether local residents themselves view the overall economic impact as positive or negative. Perceptions can be influenced by the size and particulars of the development, the residents' socioeconomic background, and the community at large (Murdock and Schriner 1979; Webb, et al. 1980). Many boomtown studies label the residents of boomtowns as "victims", but there is little evidence that residents see themselves in this fashion (Thompson and Blevins 1983). Additionally, many local residents have been found to cite nationalism or civic pride at helping the country as the primary or secondary reasons for supporting nearby energy development, even if they disapprove of most of the local effects (Lovejoy and Little, 1979). Sev-

eral research projects have noted that while both men and women typically favor rural energy development, men favor the development more than women. Reasons for this disparity often focus on the assumption that men are most likely to value (and benefit from) employment and economic impacts, while women place more value on environmental, health, and quality of life concerns (Stout-Wiegand 1985).

Social Impacts

Social impacts to residents of boomtowns can vary greatly and are often most dependent on whether the resident had lived in the community before the boom (i.e. "old timer") or had moved to the community as part of the boom (i.e. "newcomer") (Davidson 1979; Freudenburg 1982). However, in addition to specialized groups of citizens (outlined below), there are a number of social trends that appear common to all residents or difficult to pinpoint upon a single group. In his widely-quoted paper discussed heretofore, Kohrs discusses disproportionate increases in mental health case loads, crime, divorce, suicide, and alcoholism in his impacted community as compared to nearby non-impacted communities. While Kohrs' work has been criticized as unscientific, later research has determined that in many boom communities such social problems did indeed occur at disproportionate rates when compared to non-booming communities. Social service case loads can skyrocket, in many cases at rates faster than even the population increase. Most studies have found that impacts in these areas cannot be attributed exclusively to either oldtimers or newcomers, and the reasons for these increases have not been concretely determined. The stresses of social change, uncertainty, isolation, inadequate housing and infrastructure, and substandard services are generically blamed. (For collections, see Davenport, J.A. and Davenport, J. III 1979 and Davenport, J. and Davenport, J.A. 1980; for alcohol abuse, see Lantz and Halpern 1982; for mental health see Freudenburg 1983; for mental health and alcohol abuse, see Brown 1978; for social service demand, see Lantz and McKeown 1979; for women and families, see Moen, et. al 1981, for crime and divorce, see Vlieger 1985; for divorce, see Wilkinson et. al 1984; for a discussions of crime, see Wilkinson et. al 1984b, Brookshire and D'arge 1980, and

Freudenburg and Jones 1991; for perceptions of crime, see Krannich, et. al. 1989).

Different Impacts to Different Groups

Several sociologists (including Davidson 1979 and Freudenburg 1982) have provided a summation of previous research on the impacts to different social groups in a rapidly growing community, as each group will often receive a different set of social and economic benefits and costs.

A longitudinal study of the boomtown of Delta, Utah (Brown, R., S. Dorius, and R. Krannich. 2005) is important as it involved research of the community before, during, and after the boom and bust. The study found that community perception of negative impacts was at its highest during the initial stages of growth and development, despite the fact that the fastest levels of growth had yet to occur.

Newcomers

As discussed in the above sections, the community bifurcation between newcomers and original residents (or "old-timers") in boomtowns is well documented, especially in the context of rapid population growth. Newcomers as a group are viewed as receiving a number of social hardships, including substandard living conditions, stress from moving to a strange and isolated community, and social isolation from hostile long-term residents. For example, residency in boomtown mobile homes has been shown to be disproportionately comprised of newcomers (Massey and Lewis 1979). On the other hand, having moved to the community for employment reasons and presumably well-skilled and experienced to take advantage of the employment opportunities, newcomers are in a good position to realize the positive economic impacts.

Newcomers can be effectively broken down further into temporary (or transient) newcomers in the area for the immediate development phase, and permanent newcomers who are in the area for the long-term maintenance or production phase. Due primarily to differing job requirements,

each group will likely have different socioeconomic backgrounds. Transient newcomers -- receiving high pay, temporary living conditions, and little required investment in the community – may realize more positive economic impacts from the development but with only temporary negative social conditions. Women and family members who arrive at a boomtown (typically for their spouse's employment) are often found to face increased hardships. Since most newcomers are disproportionately male, many women face social isolation in new and oftentimes substandard housing locations, and as the primary caregivers for their family, women bear the brunt of inadequate social and medical services. (For a summations and case studies on women, see Moen 1981, Moen, et. al. 1981, and Feldman, 1981)

So-called permanent newcomers attached to long-term maintenance or production positions receive the positive impacts of high pay and stable employment, but because of the need to integrate into the community and utilize family services, such persons may receive a larger number of the negative impacts of alienation and poor social services (Malamund 1983). However, unlike the transient workers, a portion of these permanent newcomers are what can be deemed "new professionals" who are more educated, more likely to assume leadership positions, etc; and are more welcomed in the community at large (Davidson 1979).

Long Term Residents (Old-Timers)

Long term (or "old-timer") residents can be broken down into several groups. However, most groups share the impact of a changed way of life in the community. It is often small changes that one day coalesce into a view that their community has fundamentally changed: the traffic becomes unbearable, residents feel the need to lock their doors for the first time in their lives, they are now asked to provide identification at a store where they had previously shopped for 30 years, local personalized services are no longer available, etc. Many of the new attributes in the community are characteristics perceived to be most associated with urban areas, but become characteristics of rural environments during periods of high growth (Davidson 1979; Freudenburg 1982).

Public officials and local public servants are often the least likely to receive pay increases, yet are required to provide a larger volume of services than before the boom and make decisions in an environment of extreme uncertainty, all of which will likely lead to higher stress and poorer working conditions among these groups.

Freudenburg (1982) cites a study of farmers and ranchers that had shown farmers who intend to sell or lease their land to energy development are significantly more likely to support such development than farmers who do not intend to do so. Farmers not associated with energy development are also at risk to face inflationary pressures although their income levels may remain unaffected. Farmers in primarily rural and agrarian communities may also perceive a threat to their social status as the most culturally and economically significant sector of the community. Ranchers and ranching culture is especially informal in many communities and ranching and farming families may also be some of the longest residing families in the area, and may particularly resent changes to the historical way of life (Jobes 1987).

Local Business Owners often receive greater sales activity although research is mixed on the extent businesses benefit from this activity *(see discussion on local businesses, bottom of page 14 and page 15)*. While most businesses may ultimately receive greater profit margins, the profits are often overestimated during the initial stages of development compared to what is realized during the height of the boom.

Common assumptions hold that elderly persons are often the most at risk as they face a double impact of largely fixed income among high inflation as well as more ridged resistance to social changes in the community. Additionally, many boomtowns may have a disproportionately high percentage of elderly persons as boomtowns tend to be in rural and previously economically declining areas. Overall, the evidence for increased economic hardships appears to be real, while the evidence for increased social hardship is mixed and largely anecdotal, and at minimum de-

pends on the historical context of the community.

Youth are found to face mixed impacts as they may receive greater job opportunities but will also have to deal with increased crime in their community and overcrowding of schools. Some studies even suggest that boomtown students are more likely to move away after high school than in comparison communities (for a detailed discussion, see Freudenburg 1984b).

Criticisms of the model

The social disruption model received scrutiny from a number of prominent social scientists who criticized the imperfect data collection, inconsistent methodologies, over-assertion of negative impacts, and the under-assertion of the positive economic impacts (Krannich and Greider, 1984; Wilkinson et. al. 1982, Thompson 1974; Freudenburg 1982). It should be noted that many of the most prominent social disruption critics have also contributed some of the most important works to the field, both before and after publishing their criticism.

Along these lines, one criticism is that the economic linkages between individual, industrial, and economic sectors in a boomtown are poorly described at best, and an actual quantitative tally of costs and benefits are scarce (Brookshire and D'arge 1980).

The majority of boomtown research was conducted during the height of growth and industrialization, and few studies were conducted before the boom or after the growth stopped and often quickly reversed (a/k/a "The Bust"). A desire among researchers for longitudinal analysis of boomtown growth is commonly expressed (Freudenburg 1982, Seyfrit 1988; Freudenburg and Gramling 1991). Moreover, with the exception of occasional studies of coastal towns near off-shore drilling, none of this research has occurred in areas east of the Mississippi river – areas which on balance have dramatically different histories of development, population densities, proximity to urban areas, land ownership patterns, and ecological systems.

The Bust

The bust is a tremendously important factor of energy development, especially in the context of boomtown communities. Almost all of the boomtown communities that were researched during he 1970s and early 1980s went through a severe economic downturn as the construction or development phase of the industrialization process was completed and entered into a much less labor intensive phase of energy production (in a smaller array of cases, the commodity price simply collapsed and the energy project was shuddered).

The spike of workforces needed for the construction or development phase of energy development relative to the much smaller production phase cannot be overstated. Many population growth estimates are created by researchers, developers, and local officials that assume growth rates predicated on an endless construction phase. Oftentimes, a "Phase II" that would continue the need for the massive but temporary construction workforces is promised by developers but never materializes.

The bust presents significant planning and policy implications for mitigating over-building of housing, retail services and government services. The situation is often a "catch-22": providing the foundation for long-term economic development requires attracting companies and sectors unrelated to the energy industry, which in turn requires government investment in housing, infrastructure, and services during the boom times to make the community attractive to these companies. An ideal situation would entail the attraction of non-energy development companies precisely during the time of the energy-industry downturn, a situation that would be difficult if not impossible to engineer on a consistent basis.

Part Two:
The Case Study of Sublette County Wyoming

Sublette County, located in Southwestern Wyoming has experienced dramatic rates of growth and industrialization due to the development of two massive natural gas fields that began around the year 2000 and intensified in about 2003 (see figure 6, page 26).

Sublette County is extremely rural, having a pre-boom 2000 Census population of less than 6,000 people over an area of 4,883 square miles (US Census Bureau 2008). Three incorporated municipalities are located in the county: the towns of Big Piney, Marbleton, and Pinedale, each with pre-boom populations in the year 2000 of 408, 720, and 1402, respectively. The majority of the remaining population was located in the unincorporated areas near these communities. Prior to the boom, the community relied on a combination of tourism and agriculture, as well as a declining mining industry related to a prior natural gas drilling boom experienced in the southern end of the county in the 1980s.

The gas fields, The Jonah Field and the Pinedale Anticline Field, are located congruently on remote high-altitude sagebrush areas that are managed by the United States Department of the Interior's Bureau of Land Management. The gas formation is located primarily at approximate depths of between 7,500 to 15,000 feet, and situated in what is called a "tight sand" geologic formation that requires hydraulic fracturing upon completion of the drilling process (BLM 2006). The Jonah and Anticline fields are estimated to contain a minimum of 28 Trillion Cubic Feet of

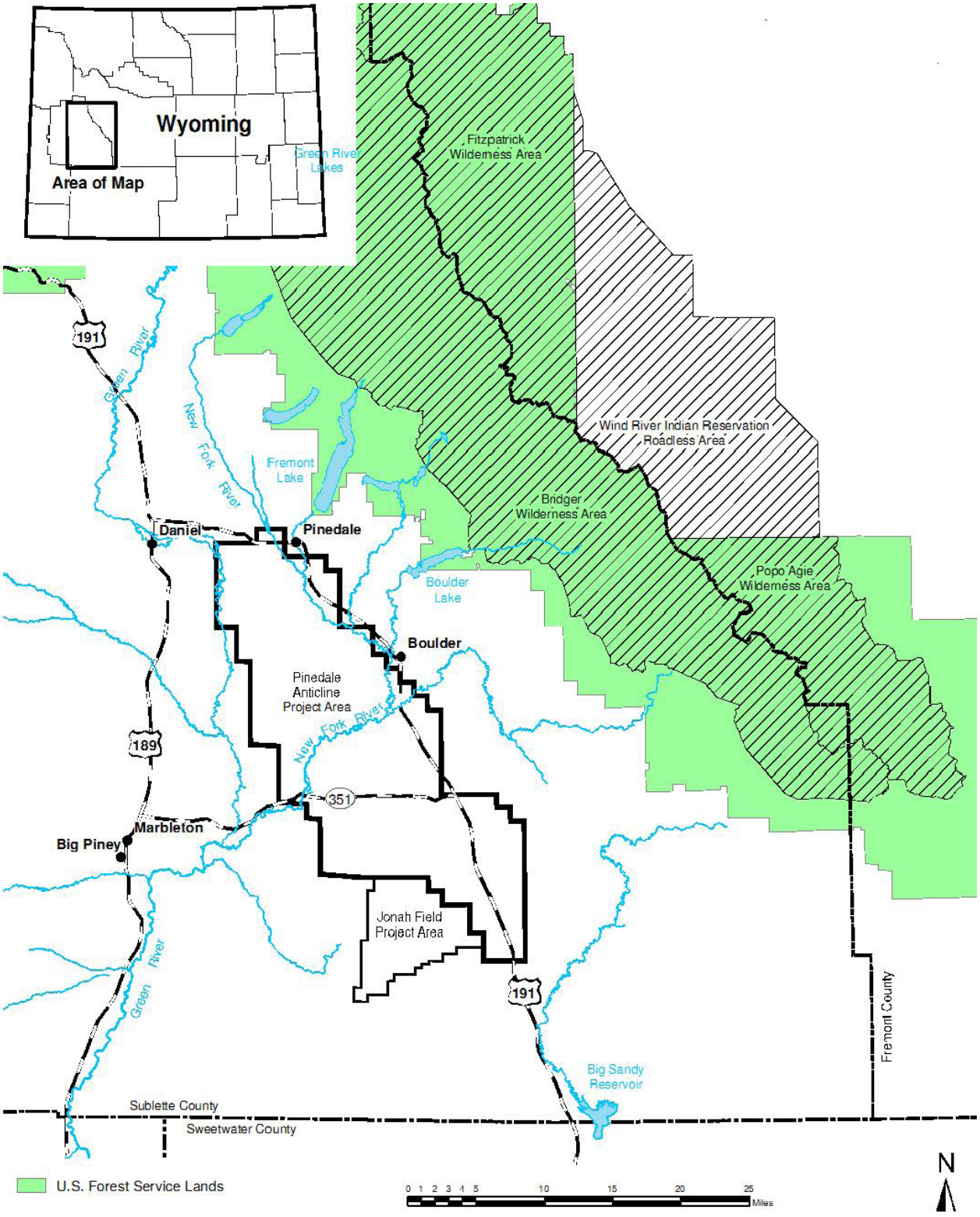


Figure 5: A Map of The Sublette County Area of Wy oming that depicts the two major gas fields along with the towns of Big Piney, Marbleton and Pinedale. From BLM 2008, p. 1-5

combined recoverable natural gas reserves, making them two "of the most highly concentrated, highly productive sweet natural gas fields in North America" (BLM 2006) (Ultra, et. al. 2007).

Historical and Cultural Context

Pinedale

The town of Pinedale is located along the Wind River Mountain Range and the Bridger Teton National Forest and is within a mile of the northern boundary of the Pinedale Anticline Field. Pinedale, as the county seat of Sublette County and the largest town in the county with a pre-boom 2000 Census population of 1419 people, is the primary provider of retail and government services for the county. The town has a strong western aesthetic and ranching heritage and became an attractive destination for tourists and amenity-led immigrants purchasing seasonal homes in the area. The second home trend increased greatly during the 1990s, and in 2000 the greater-Pinedale area along the Wind River Range recorded the highest percentage of seasonal homes in the State of Wyoming, when compared to the number of primary residences (Jacquet 2005). The county as a whole grew about 22% from 1990 to 2000 with the majority of that growth occurring in and around Pinedale (WDAI 2002). The town historically saw large seasonal fluctuations in employment as the tourism and ranching industries, as well as state and federal land management agencies, added employees during the summer months (see figures 8 and 9, page 28). Importantly, the Town of Pinedale largely did not feel the effects of the early 1980s gas boom that took part in the southern part of the county. While some Pinedale residents worked in the gas industry during that time, most did not, as the company operations were confined to the southern parts of the county.

Big Piney and Marbleton

The towns of Big Piney and Marbleton are closely situated together in the south-western part of Sublette County, about 20 miles east of the Wyoming mountain range and the Bridger Teton National Forest. With pre-boom 2000 US Census populations of 410 and 723, respectively, Big

Piney and Marbleton are located about 15 miles west of the natural gas fields, although they lie at the eastern terminus Wyoming Highway 351, which is a major access road to the gas fields. Big Piney and Marbleton experienced a relatively short-lived natural gas extraction boom in the extreme southwest portions of Sublette county and northeastern corner of Lincoln County during the early 1980s. The towns hosted a number of worker camps associated with the development phase of drilling and experienced boomtown pressures (Blevins et al. 2005). While the vast majority of workers left the town after the completion of the development phase, a core of workers remained for the production phase, and many of the long-term Big Piney and Marbleton residents have employment ties to that work. Prior to the current boom, the towns had a slowly declining population during the 1990s as the jobs with the development phase were declining. Without as much retail and government services, and with a further distance to popular natural amenities, the towns largely did not receive the stimulus from tourism and amenity-related development.

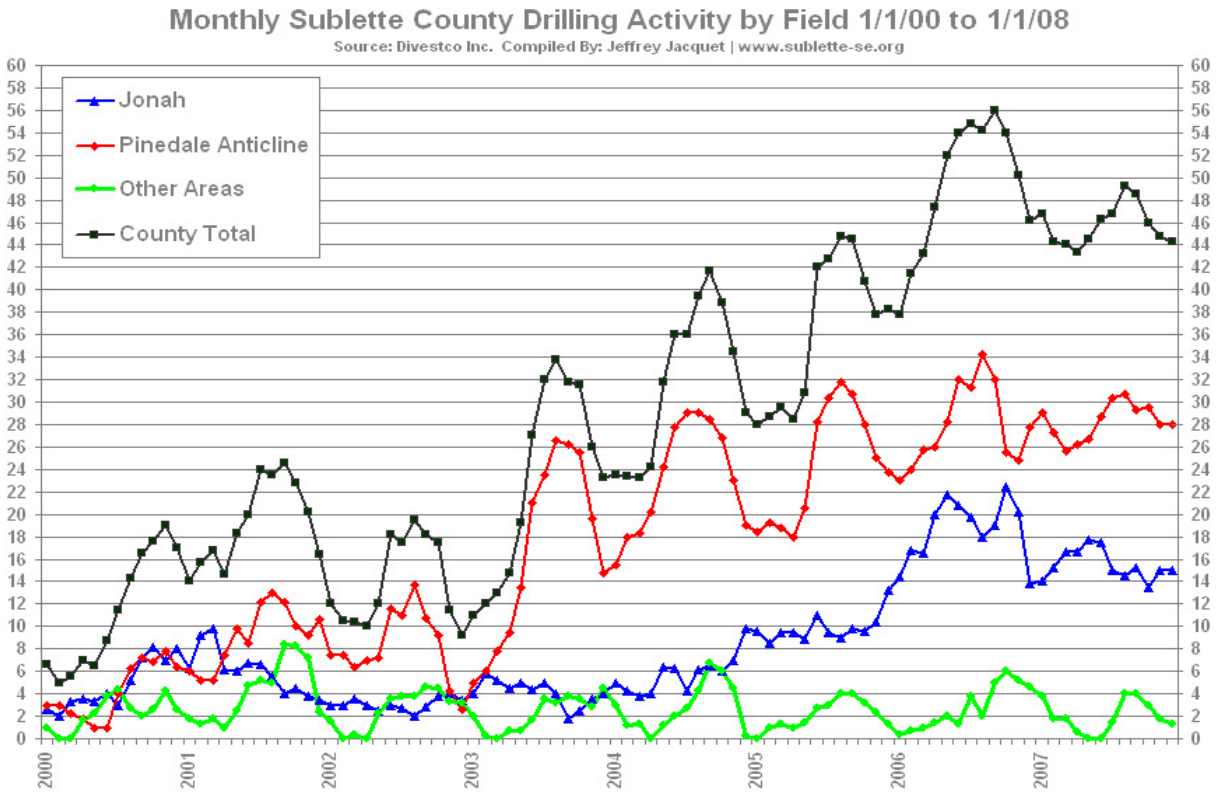


Figure 6: Monthly Drilling Activity in Sublette County, by Field January 2000 to January 2008

Energy Development

Development began in earnest in the Jonah and Pinedale Anticline fields around the year 2000 when the number of drilling rigs operating in the fields jumped from 2 to 18 over the summer and then to 24 by the summer of 2001. However, many of the rigs were working in southern areas of the county, and much of the industry offices and infrastructure were located in Rock Springs, a town of approximately 20,000 people located about 100 miles to the south of Pinedale and adjacent to Interstate 80 and the railroad. In 2003, the number of drilling rigs in Sublette County jumped to 34 and the natural gas price spike that followed Hurricane Katrina in 2005 pushed the rig count to a high of 56 in the summer of 2006. Around that time, the energy industry started to build company offices, industrial yards, temporary housing, and other infrastructure near Pinedale. Since the peak of 2006, the rig count has remained in the mid-to-high 40s as the commodity price has continued to fluctuate. In 2008, a number of land management decisions were approved that ensured the energy companies long-term access to development in the fields.

Employment and Demographic Impacts

Transient Populations

Transient worker populations in Sublette County are difficult to quantify. A majority of the work-

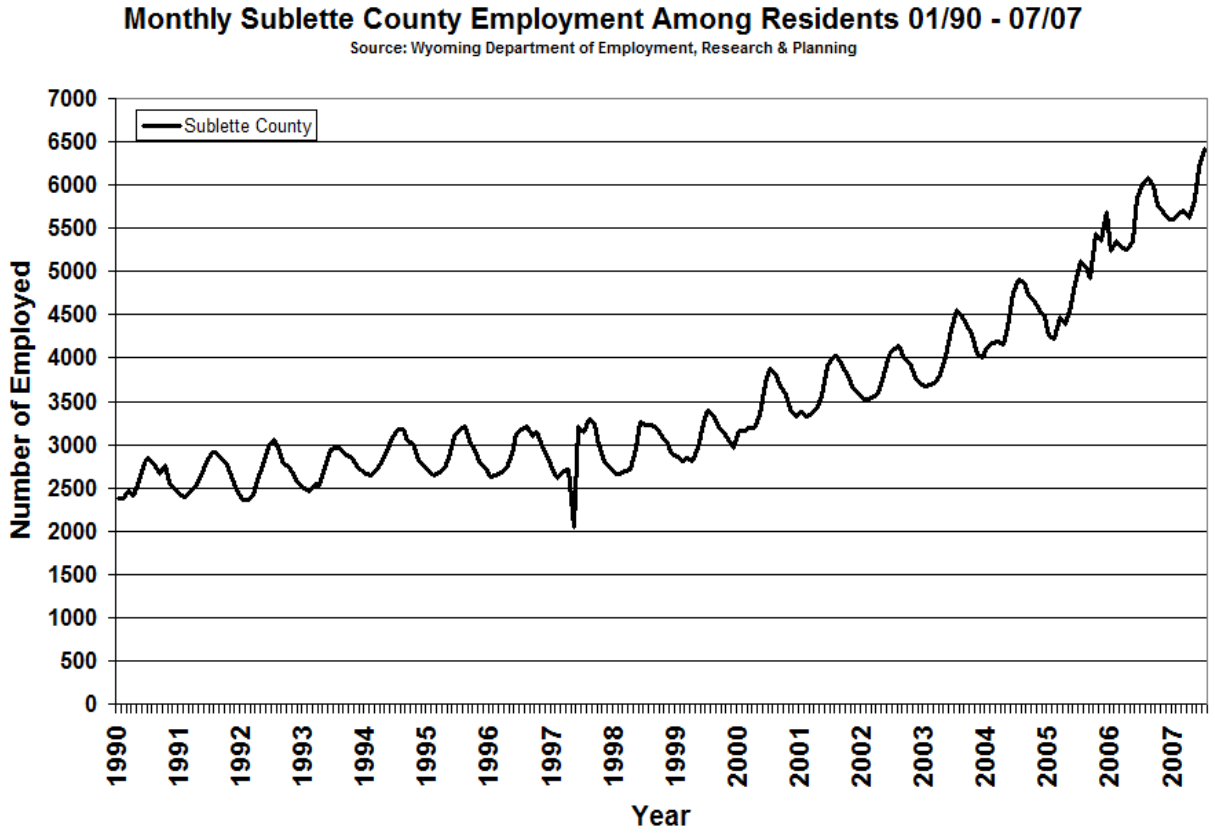
Table 1: Average Workforce Requirements Per Sublette County Well[1]

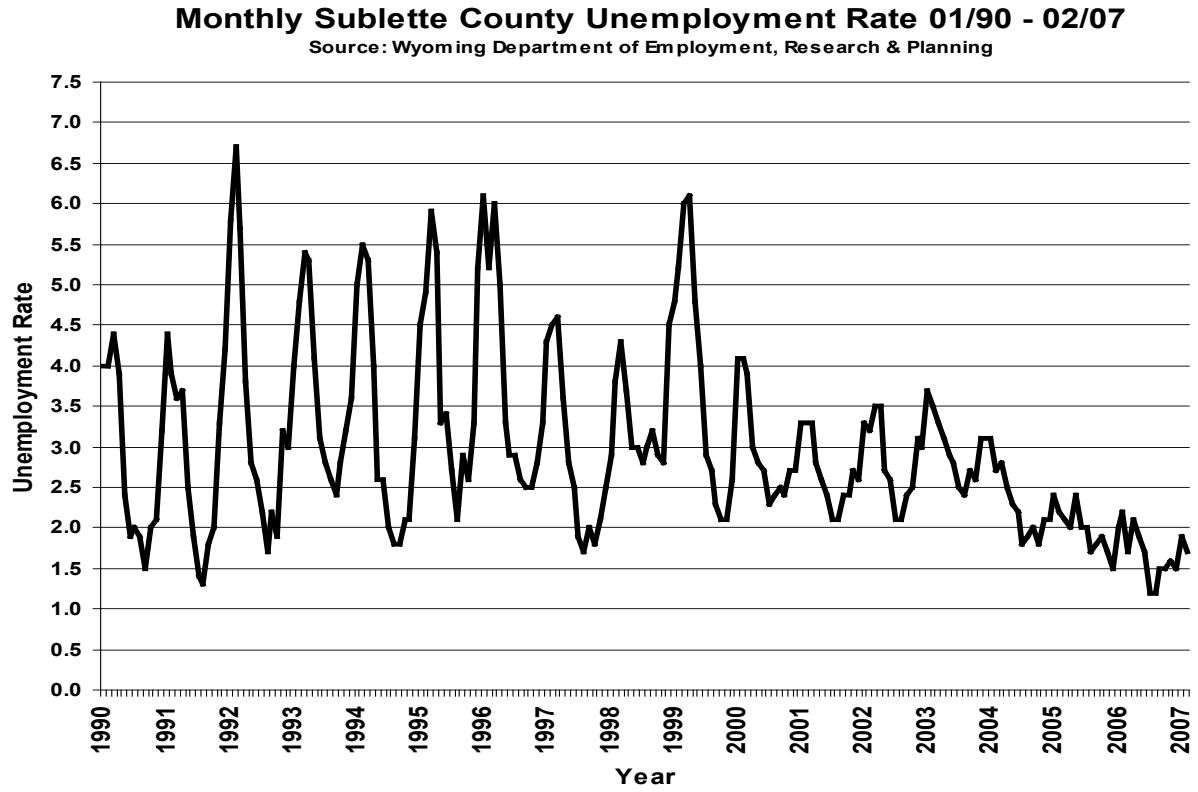
Category	Avg. # of Days[2]	Avg. # of Workers	Avg. # of Worker Days
Construction:			
Well pad and acess road construction	4	4	16
Rig Transportation/Setup	5	15	75
Drilling:			
Roughnecks	31.75	12	381
Tool-Pushers & Supervisors	31.75	9	285.75
Completion:			
Cementing	2	6	12
Stimulation	6	13	78
Perforating	3	5	15
Logging	1	3	3
Pipeline Construction:	4	6	24
Total Per Well:		73	889.75

[1] Does not include additional support/service industries and workforce. Based on Jonah Infill FEIS Socioeconomic Technical Support Document; PAPA FEIS; Operator Data

[2] Drilling Time = 22 days per well for Jonah Field Drilling; 35 days per well for PAPA Drilling. Formula: [(Jonah Drill TimexRigs in Jonah) + (PAPA Drill TimexRigs in PAPA)]/(Rigs in Jonah + Rigs in PAPA) or [(22x10)+(35x30)]/(10+30)

Figure 7: An estimate of the Workforce Requirements throughout the process of drilling a well in Sublette County. From Jacquet 2006, p. 7


Monthly Sublette County Employment Among Residents 01/90 - 07/07
Source: Wyoming Department of Employment, Research & Planning
Sublette County
Number of Employed
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
Year


Monthly Sublette County Unemployment Rate 01/90 - 02/07
Source: Wyoming Department of Employment, Research & Planning
Unemployment Rate
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
Year

Figures 8 & 9

forces live in non-traditional housing units such as employer-supplied dormitories (i.e. "man-camps"), motels, and R.V. parks which do not typically affect the building permit or drivers license trends that are the basis of state and U.S. Census bureau population estimates. Additionally, many of their employers are headquartered out of the county or state, and therefore their employment status will be tabulated and recorded in these other areas. Rapid increases in area employment numbers between 2005 and 2007 that far outpace population increases during that same period suggest that the transient workforces (see figure 8, page 28) are gradually being accommodated into the employment estimates as employers establish local offices.

The transient workforces are primarily employed by the drilling, hydraulic fracturing, and pipeline construction crews and therefore the number of drilling rigs in the area determines the overall size of the transient workforce. Transient workforce estimates based on an extrapolation of per-rig workforce requirements and a census of non-traditional housing units were developed in 2006 at the height of drilling (Jacquet 2006; 2007a). The estimates found there were approximately 1500 transient residents living in the county at any given time in non-traditional housing units, and if counted, would increase the county's population by an additional 21% (Jacquet 2006; 2007a). Almost all transient workforces rotate in and out over a one or two week period, meaning that a total of about 3000 individuals were estimated to be rotating in and out of the county each month. The rotational schedule presents additional problems when estimating population and workforce requirements, especially when calculations de-

Change in Age and Sex Distribution Among Sublette County Residents 2000-2007

Source: US Census Bureau 2008b

Age Group	Change in Population	Change in Maleness
0 to 4	47.13%	-0.40%
5 to 9	24.94%	0.73%
10 to 14	7.16%	-1.12%
15 to 19	18.36%	0.37%
20 to 24	125.41%	3.91%
25 to 29	133.22%	-0.27%
30 to 34	53.70%	0.05%
35 to 39	-6.40%	3.07%
40 to 44	1.15%	-0.59%
45 to 49	11.66%	0.61%
50 to 54	47.83%	-1.67%
55 to 59	58.94%	2.16%
60 to 64	51.02%	1.10%
65 to 69	11.79%	-2.43%
70 to 74	24.39%	-3.29%
75 to 79	52.63%	2.39%
80 to 84	-13.27%	1.21%
85 & over	23.61%	-2.67%

Figure 10

pend on using a typical full-time work equivalent. The workers, due to working a 12-hour shift for 7 straight days, with 7 days off, are essentially full-time employees but only live in the area half-time. The total rotation population is important to consider when calculating stress on such services, such as the court system, where two separate rotations could create greater demand than a single continuous population. Additionally, two separate rotations will double the number of individuals considering permanent residency in the area.

Demographic data on these transient populations is extremely hard to obtain. In the natural gas industry, the energy company (or operator) contracts out the vast majority of work to a array of contractors and sub-contractors, and the energy companies have little direct ability, or more importantly desire, to obtain population or demographic information from the workforces. Anecdotal evidence strongly suggests that these workers are primarily in their 20s or 30s, and are overwhelmingly male. Race, ethnicity, and nationality is much more difficult to determine, although anecdotal evidence suggests the distribution, while mostly white, is much more reflective of the nation than has been the traditional case in Sublette County.

Figure 11: Workers lay pipelines among drilling rigs in Sublette County, WY. Circa Summer 2006

Non-transient populations

Non-transient populations in Sublette County and particularly Pinedale showed increasing rates of growth in the area after 2004, according to the US Census Bureau (2008a), roughly corresponding with the jump in number of drilling rigs in 2003. Energy companies and their subcontractors began establishing offices in Sublette County after 2003, particularly in a remote industrial park called Sand Draw that was located approximately 35 miles south of Pinedale at the eastern terminus of Wyoming Hwy 351. After 2005, the county started seeing rates of growth in excess of 5% from July 2005 to July 2006 and in excess of 9% a year later, between 2006- 2007.

Sublette County Population 2000-2007 (US Census Bureau 2008)

	Big Piney			Marbleton			Pinedale			Rural Areas			Total		
Year	Pop	Year after Year	Since 2000	Pop	Year after Year	Since 2000	Pop	Year after Year	Since 2000	Pop	Year after Year	Since 2000	Pop	Year after Year	Since 2000
2000	408			720			1,402			3,390			5,920		
2001	404	-1.0%	-0.7%	712	-1.1%	-0.8%	1,383	-1.4%	-1.1%	3,398	0.2%	0.0%	5,897	-0.4%	-0.4%
2002	421	4.2%	3.9%	742	4.2%	4.0%	1,433	3.6%	3.0%	3,549	4.4%	4.1%	6,145	4.2%	3.8%
2003	431	2.4%	5.9%	762	2.7%	6.1%	1,479	3.2%	5.8%	3,645	2.7%	8.4%	6,317	2.8%	7.3%
2004	438	1.6%	8.3%	780	2.4%	9.1%	1,545	4.5%	11.0%	3,812	4.6%	11.8%	6,575	4.1%	11.1%
2005	451	3.0%	11.0%	806	3.3%	12.2%	1,647	6.6%	16.8%	3,976	4.3%	17.5%	6,880	4.6%	16.2%
2006	453	0.4%	12.4%	848	5.2%	19.2%	1,818	10.4%	30.1%	4,122	3.7%	20.9%	7,241	5.2%	22.3%
2007	476	5.1%	16.1%	919	8.4%	27.1%	2,043	12.4%	44.0%	4,487	8.9%	33.2%	7,925	9.4%	33.9%

Figure 12

Employment, demographic, and anecdotal evidence suggests that the vast majority of these non-transient immigrants were employed in the energy industry. The average age of Sublette county residents – which were among the oldest in Wyoming, and growing older during the 1990s – grew younger from a median age of 39.8 in 2000 to 37.4 in 2007 (US Census Bureau 2008d). The age brackets that received the greatest influx were between 20 and 29, and persons aged in that bracket increased more than 128% between 2000 and 2007 (US Census 2008b). Additionally, the percentage of males in the county grew by over 3% during that time period, with the greatest growth in maleness occurring in the 20 to 24 age bracket (US Census 2008b). Hispanic populations among non-transient residents grew dramatically for Sublette County, increasing from about 110 persons in 2001 to 305 in 2007, or in terms of the overall non-resident population, an increase from about 1.8% to 3.8% (US Census Bureau 2008c). These figures concern the

Average Wage by Industry in Sublette County 2001 to 2007

Source: US Bureau of Labor Statistics 2008

	Total	Mining	Const	Manufacturing	Service	Professional	Food & Accom	Hospitality	Local Gov
2001	$25,324	$39,530	$27,545	$18,050	$19,194	$27,955	$11,817	$12,425	ND
2002	$27,461	$44,977	$27,412	$17,574	$20,637	$35,512	$12,213	$12,576	ND
2003	$29,725	$45,378	$27,660	$22,534	$22,372	$33,983	$13,138	$13,481	ND
2004	$31,891	$49,597	$33,335	$21,459	$23,100	$35,852	$13,851	$14,023	$27,748
2005	$36,751	$57,620	$38,796	$26,701	$25,849	$41,596	$16,399	$16,734	$32,877
2006	$42,307	$64,022	$44,050	$29,371	$29,810	$40,390	$20,525	$20,733	$39,443
2007	$51,694	$73,982	$50,326	$34,262	$35,720	$49,509	$26,016	$26,258	$46,067

Figure 13

Total Taxable Sales by Industry Sublette County 2005-2008
Source: Wyoming Department of Revenue 2005; 2008

Sector	2005	2008	% Change	Change
Ag/Forest/Fish/Hunt	$40,425	$132,175	69.42%	$91,750
Mining	$465,388,050	$1,040,309,675	55.26%	$574,921,625
Utilites	$10,960,875	$34,647,425	68.36%	$23,686,550
Construction	$31,810,850	$52,040,425	38.87%	$20,229,575
Manufacturing	$48,422,350	$125,729,000	61.49%	$77,306,650
Wholesale Trade	$115,330,925	$180,635,950	36.15%	$65,305,025
Retail Trade	$104,111,575	$211,370,500	50.74%	$107,258,925
Transportation	$5,181,900	$2,689,825	-92.65%	-$2,492,075
Information	$5,339,075	$8,451,425	36.83%	$3,112,350
Finance	$210,750	$1,852,575	88.62%	$1,641,825
Real Estate	$28,050,775	$131,673,300	78.70%	$103,622,525
Proffessional	$8,536,200	$4,568,700	-86.84%	-$3,967,500
Admin.	$2,581,375	$2,264,225	-14.01%	-$317,150
Arts/Entertainment	$1,173,050	$1,629,925	28.03%	$456,875
Food/Accom	$18,752,725	$42,698,650	56.08%	$23,945,925
Other Services	$55,059,725	$105,506,250	47.81%	$50,446,525
Public Admin	$38,408,750	$74,358,000	48.35%	$35,949,250
Total	$939,505,675	$2,020,651,950	53.50%	$1,081,146,275

Figure 14

permanent population estimates and do not include the vast majority of transient workforces. It is likely that if the transient workforces were included, these age, sex, and race trends would be exacerbated drastically.

Impacts to Economic Activity

Economic Activity increased greatly throughout Sublette County during this time period. Median personal wages increased from $25,324 in 2001 to $51,694 in 2007according to the Bureau of Labor Statistics (USBLS 2008). Median family wages increased in a similar manner. As a percentage, wages increased throughout all industries; however, the greatest gains in real dollars were realized in the Mining and Construction industries (USBLS 2008). Total taxable sales increased from less than $400,000,000 per year to over $2,000,000,000, with the greatest growth coming in the mining and construction industries (Wyoming Dept. of Revenue 2008). The mining sectors and sub-sectors of other industries that are primarily orientated to servicing the mining industry were estimated to generate approximately 94.9% of taxable sales in FY 2008 (Coburn and Jacquet 2008).

Inflation

Inflationary and Cost of Living Pressures increased dramatically in the southwestern Wyoming region after 2003 (the region includes Sublette, Sweetwater, Uinta, and Lincoln Counties), which roughly corresponds with the increases in drilling activity and industrialization. While no formal study has been produced on a county-to-county basis within the region, anecdotal evidence suggests that inflationary pressures were greatest in Sublette County compared to the entire southwest region. In southwest Wyoming, annual inflation rates hovered at a modest 1.9-2.7% between 2000-2003, but then jumped to over 7.45% in 2005 and 8.1% in 2008, while rates stayed stagnant nationwide (WDEA 2008).

For comparison, the compounded inflation rate between 2003 and 2008 was 43.78% in southwest Wyoming, 35.09% in Wyoming as a whole, and 21.77% in the United States (WDEA 2008). Sublette County has consistently remained the second most expensive county in Wyoming in which to live, second only to nearby Teton County, which is itself often considered the most expensive county in the United States due to the cost of housing.

Housing

Impacts to housing in Sublette County have also been dramatic. The number of permanent housing units increased 22% between 2000 and 2007; however, the permanent population increased approximately 34% during this period (a number that does not count transient residents), and the 12% gap in housing units per capita created significant demands (US Census Bureau 2008e). Housing valuation between 2000 and 2007 increased more than 150% in most areas (see figure 16, page 34) as a combination of high demand, short supply, high wages, and easy access to mortgages nation-wide during this period pushed prices upward.

Area realtors reported in 2007 that the greatest demand for home sales was between the $150,000 and $250,000 range, generally corresponding with the median family income affordability level at that time (about $225,000 per year) (Jacquet 2007). Realtors reported in 2007 that demand was

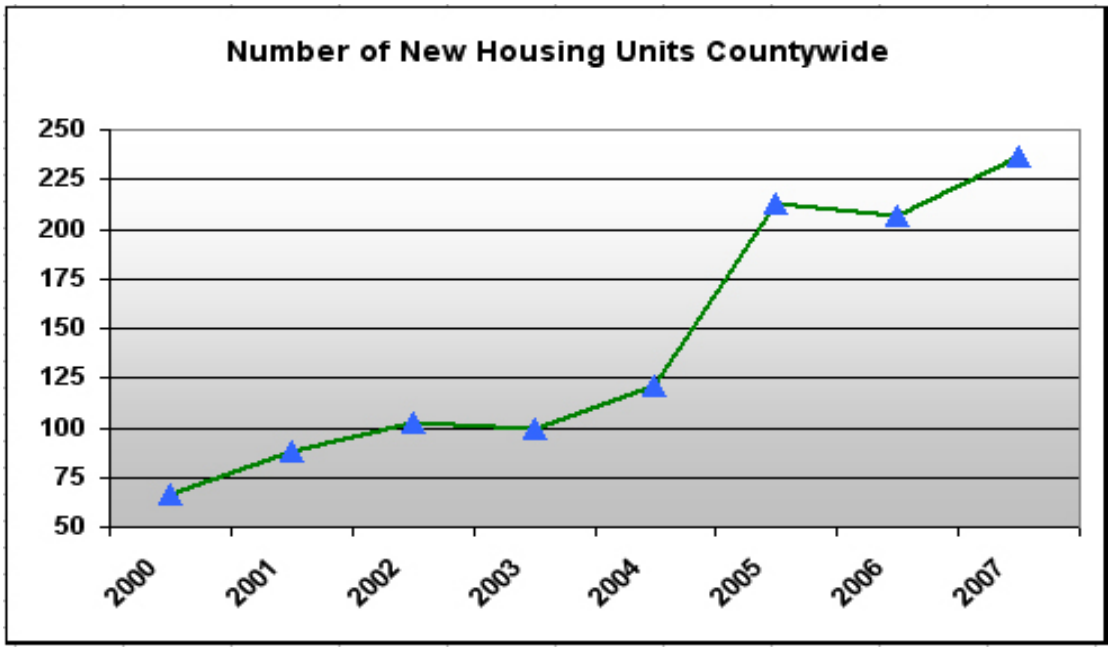


Figure 15: New Housing Units in Sublette County, Wyoming 2000-2008. From Montgomery 2008

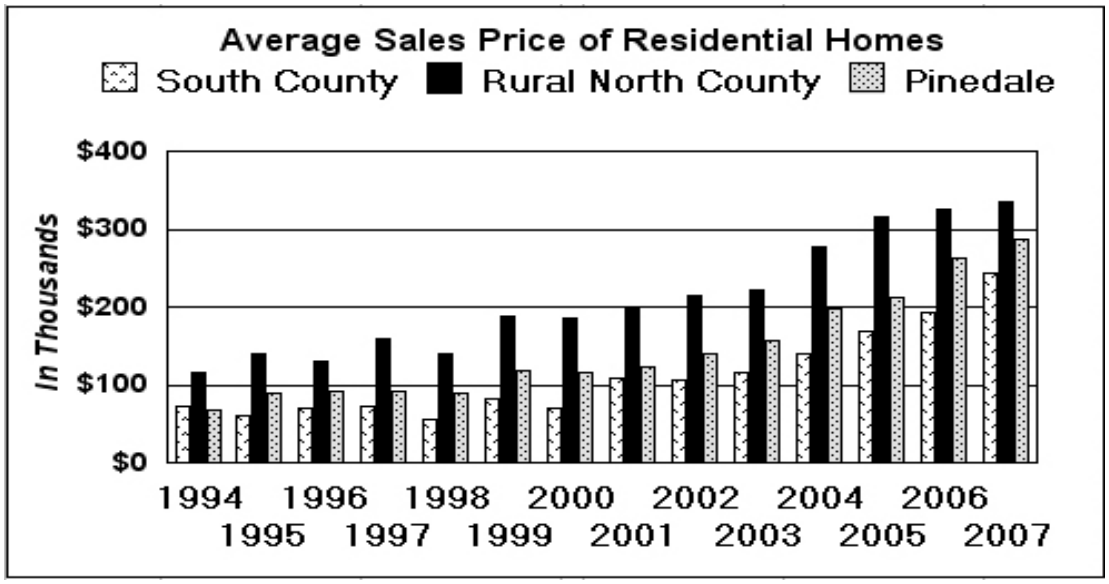


Figure 16: Average Sales Prices by Sublette County Location 1994-2007. From Montgomery 2008

roughly triple the supply for that price range, and it was noted that 86% of homes for sale in early 2007 were above $225,000 (Jacquet 2007).

Housing prices, demand levels, and affordability issues were most pronounced in the unincorporated areas in the greater Pinedale area and within Pinedale itself, although the Big Piney area also saw dramatic increases (See figure 16, page 34).

Housing rentals during this period have been in extremely short supply. It is commonplace to see classified ads requesting a combination of first month's rent, last month's rent, and a security deposit to sign a rental agreement, a total that often will exceed more than $6,000 down. Some ads even request "no kids", a request that is technically illegal but is not regulated. The average price of renting a house increased from $566 per month in 2000 to $1390 per month in 2008, or an increase of over 128% (WDEA 2008). The average price of an apartment rental went from $464 per month in 2000 to $872 per month in 2007, or an increase of over 97% (WDEA 2008), and a cursory examination of classified ads in 2008 suggests these numbers reflect the lower end of the market.

One result of the housing shortage has been several large master-planned subdivision propos-

Direct Oil and Gas Revenues For the County of Sublette and Towns

Source: Local Governments, via ERG 2008

Year	Sublette County Govt.	Big Piney	Marbleton	Pinedale
2001	$15,675,010	$1,564,123	$2,189,120	$2,253,178
2002	$21,156,928	$1,527,205	$2,688,177	$2,725,136
2003	$21,149,887	$1,515,172	$2,669,507	$2,700,676
2004	$28,366,047	$2,012,634	$6,913,024	$6,943,193
2005	$37,652,129	$2,649,031	$4,672,212	$4,703,126
2006	$52,641,542	$3,680,492	$6,490,976	$6,523,268

Figure 17

als in Pinedale and the Big Piney-Marbleton area. The large subdivisions were promoted as an answer to problems of affordability, rural sprawl, and shortages among mixed usages, including commercial. However some residents felt the subdivisions to be too large, to be built to quickly, and would dominate the housing market. The Pinedale subdivision, named The Bloomfield, is designed to provide as many as 900 residential units at the conclusion of a 10-15 year build-out period, which could theoretically double the size of the town if developed to full capacity. The Bloomfield, while ultimately supported and annexed by the town of Pinedale, proved to be controversial among residents. Several subdivisions have been developed in Big Piney and Marbleton that are of a relatively similar size to those communities, although the subdivisions proved to be far less controversial in those towns.

Impacts to Local Governments

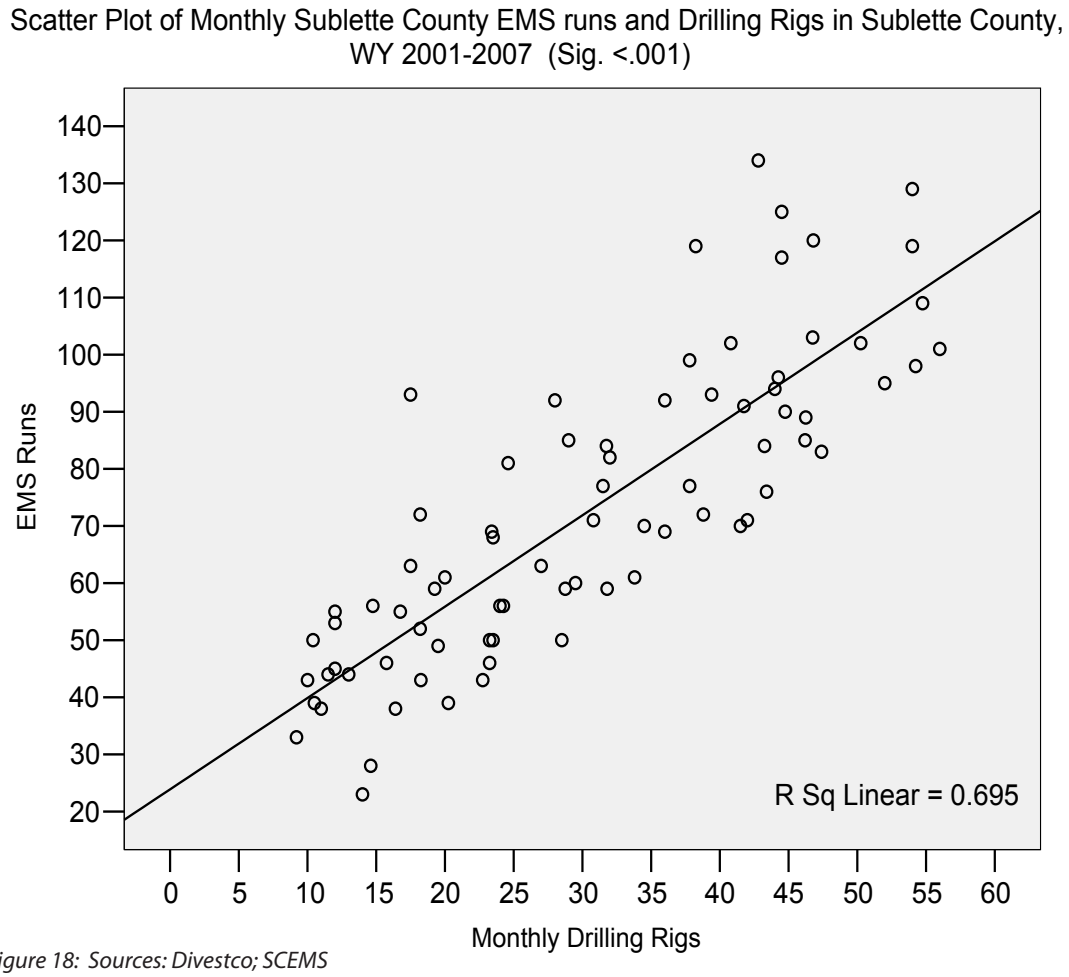


Figure 18: Sources: Divestco; SCEMS

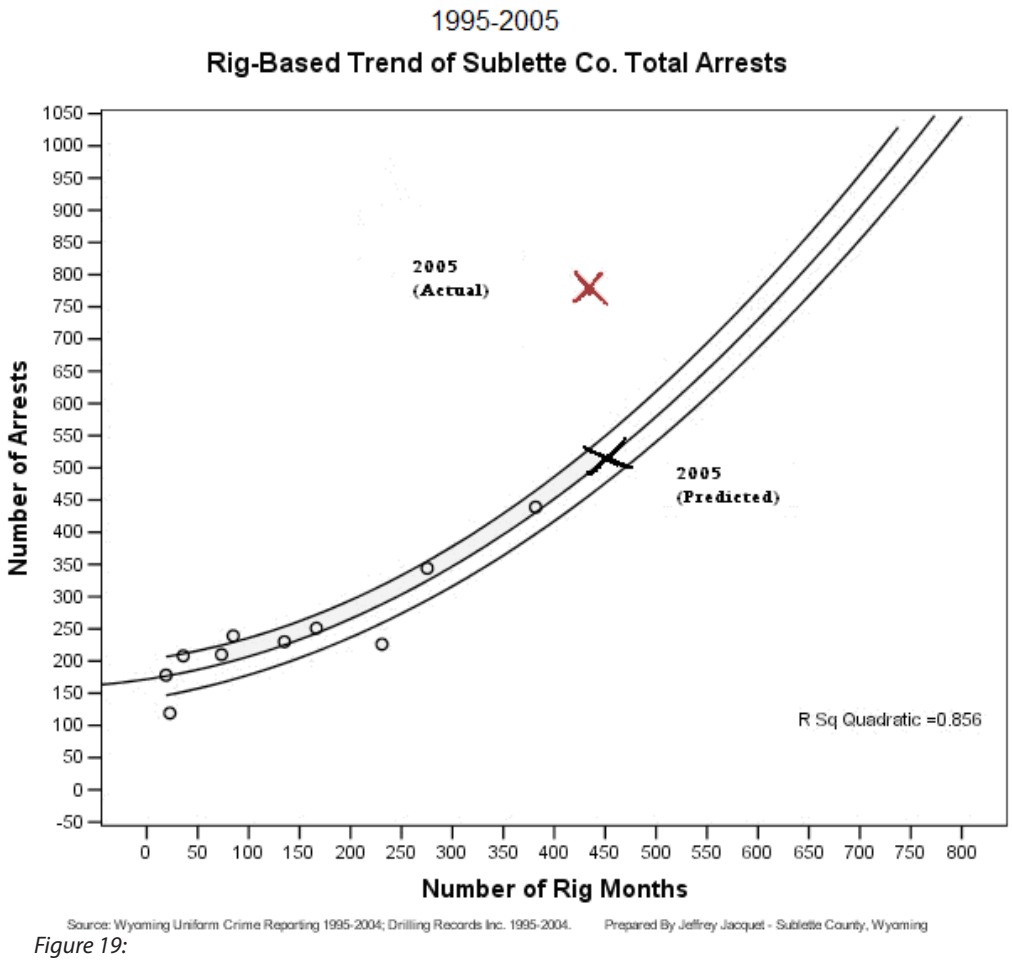


Figure 19:

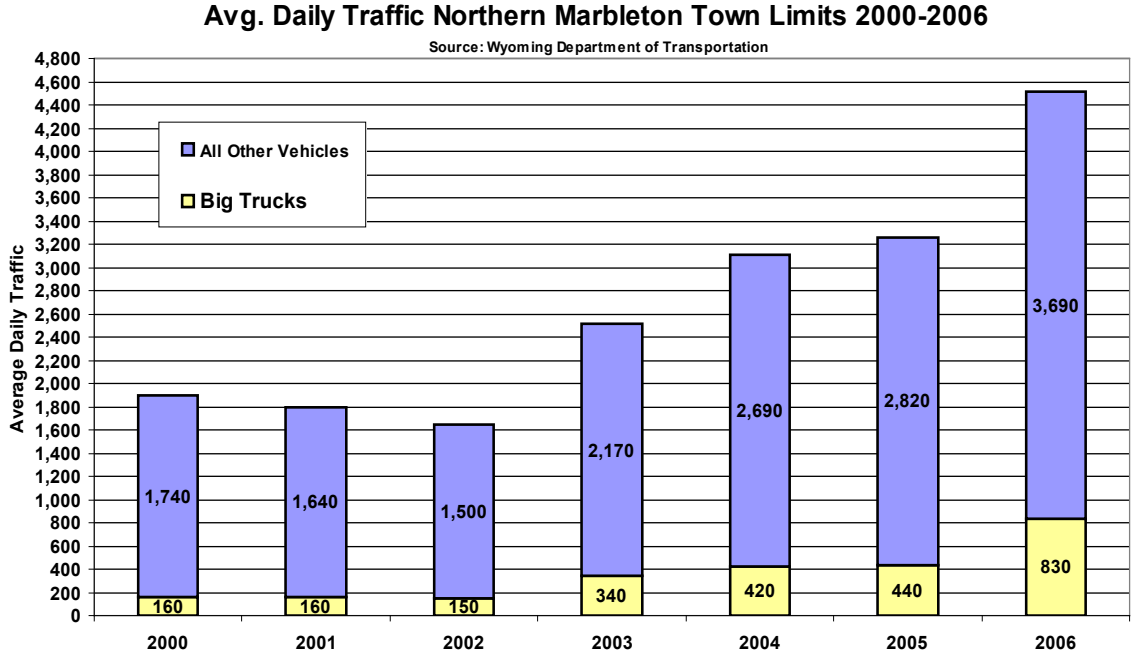


Figure 20:

The local governments of Big Piney, Marbleton, Pinedale, and Sublette County saw large increases in both revenues and expenditures due to royalties from natural gas development and the mitigation of impacts from the development. The towns of Big Piney and Marbleton saw revenues increase enough to match needed infrastructure projects although with little money left over, while significant revenues to the town of Pinedale have not been enough to meet infrastructure, maintenance, and administration demands. There is also the constant fear among local governments that the state and/or federal government will re-distribute the revenues due to political demands from other areas and a lack of knowledge on the level of required expenditures. The Sublette County government has as of 2008 retained a surplus of funds, even after expenditures; however, it is not permissible under Wyoming State Statute to directly transfer those funds to town governments. Thus, a number of joint powers boards and creative real estate transactions have been developed to aid in the transfer of some funds to towns for specific projects.

Federal and State Response

The Bureau of Land Management, the federal agency in charge of the mineral development on federal lands in Sublette County, offered little support to socioeconomic concerns in the area. Socioeconomic impact statements required as part of the NEPA process for several energy development projects occurring between 2000 and 2008 were produced and ranged from woefully inadequate to acceptable; however, the agency offered little to no assistance to local governments in mitigating these impacts. The BLM's response to socioeconomic issues was hampered by several key restraints, including political, legal, and staffing resources. The BLM put into place a citizen advisory board for one of the gas field projects, and this board had a socioeconomic sub-committee. However, the advisory board suffered from a lack of actual authority, as well as a lack of jurisdiction all gas field activity in the region.

The State of Wyoming provided significant funds for certain mitigation items through the State Lands and Investment Board, including highway expansion, as well as significant infrastructure

funding for certain municipal projects. Such funding has not adequately paid for current and future infrastructure projects, however.

Pinedale

The town of Pinedale, despite receiving over $20 million dollars in Oil and Gas revenue since 2000, has spent all of this revenue on water, sewer, and roadway infrastructure, and has identified over $30 million dollars of additionally needed infrastructure projects (including items such as sewer and water transmission lines, flood mitigation, etc) (ERG 2008). Most projects are either directly needed to accommodate new capacity or were existing problems that became exacerbated due to increased usage. It is likely that sustained revenues from the production phase of gas extraction will eventually pay for these infrastructure projects, however the projects are needed immediately. Despite the large revenues, the town of Pinedale plans to ask for state bonding to pay for these projects. Since 2000, the town of Pinedale has also more than doubled its administrative and maintenance staff, hiring a new code enforcer, planning and zoning administrator, engineer, and mayor's assistant in recent years.

Big Piney and Marbleton

Big Piney and Marbleton also have large infrastructure projects scheduled or underway, which are expected to consume most of the current gas revenues directed to these towns. Most of these projects are required for growth accommodation, including street repair required due to heavy truck traffic, water/sewer upgrades, sewer lagoon expansion, water well expansion, and a large water/sewer transmission line to help accommodate a new subdivision. However, the two towns have not yet seen the same level of growth as the town of Pinedale and have had more solid existing infrastructure.

Sublette County

County government primarily manages the court systems, vehicle registration, the sheriff's office

(the towns do not have their own law enforcement), county zoning and building regulations, and road maintenance. A county-wide special taxation district manages the emergency medical services and the two medical clinics located in Pinedale and Marbleton. Heavy truck traffic, ambulance runs, medical visits, court cases, arrests, and reported crimes all increased far faster than the population increased between 2000 and 2008, reflecting the disproportionate impact from transient workers and industrial activity (ERG 2008; Jacquet 2005b). Bi-variate regression analyses have shown fluctuations in traffic citations, ambulance runs, arrests, traffic, and reported crimes to be strongly correlated with the number of drilling rigs working in the county on both a monthly and annual basis (ERG 2008; PAWG 2006; Jacquet 2005). Similar seasonal fluctuations in the tourist season may account for a portion of the monthly correlation, however the correlation combined with the overall increases seem to mirror the level of industrialization measured by the rig count.

The county government has added significant numbers of administrative and maintenance staff, sheriff's deputies, court staff, and medical personnel. The county has outgrown the recently remodeled and expanded county courthouse and administrative buildings and is in the process of constructing new buildings for new courthouse and administrative staff. The county government (especially the sheriff's department and attorney's office) has been plagued by high rates of turnover, as the already high wages paid by the county are usually not enough to either a) compete with the natural gas industry or b) offset the undesirable cost of living and living conditions for new recruits. To make the situation more difficult, the county government also comes under fire from local business owners for offering wages that are higher than many local non-gas industry businesses can afford.

Social Impacts

One quantitative study of social changes to Sublette County noted that perceptions of change were somewhat different between the southern Big Piney-Marbleton area of Sublette County and the northern Pinedale Area because Big Piney-Marbleton had previous experience with both

boom and bust and the blue-collar culture of the natural gas industry, while Pinedale did not (ERG 2008). Big Piney and Marbleton had experienced booms in the 1950s and again in the 1980s and after that time Big Piney erected a simulated oil derricks in a town park while Marbleton's town logo was changed to feature a cowboy riding an oil pump jack. Meanwhile, Pinedale did not have such boom experiences and retained its ranching and mountaineering image. While all the towns face a similar assortment of economic and governmental challenges, it has been noted that social impacts are perceived to be greater in the Pinedale Area.

A recent survey of long-term Sublette County residents found a number of interesting social effects on so-called "oldtimers" and the relationship with boomtown newcomers (Coburn 2008, Coburn and Jacquet, forthcoming). The majority of the long-term residents surveyed rated their overall community satisfaction as having decreased since the boom began and viewed social relations within the community to have declined. Half of all respondents perceived environmental impacts to have negatively impacted quality of life in the community. When asked to list the positives and negatives of living in their community, respondents almost exclusively filled the negative column with gas industry and growth related factors, while filling the majority of the positive column with long-standing community attributes not related to industry or growth. When asked to list the biggest changes since the boom, the arrival of newcomers and their perceived lack of friendliness was the most frequently reported change by survey respondents. Most of the long term residents reported newcomers as overall good people of strong character with a few bad apples that have changed the community for the worse through their sheer numbers and disparate culture. Despite the changes, most respondents still indicated they feel at home in the community and still rate their overall satisfaction as high, even if it had decreased over the years. Other findings included an inverse correlation between age and perceived financial gain, and that residents considered the greatest changes to have occurred towards the beginning of industrial activity and not at the height of the activity. Growth management was reported to be the greatest priority for the community.

A survey of high school students in both Big Piney/Marbleton and Pinedale found that the vast majority of high school students were not interested in pursuing careers in the gas field or receiving vocational education for these careers, despite the natural gas industry providing some of the best wages and long-term career advancement ever seen in the area (Jacquet 2007c). While not a majority, a higher percentage of high school students from Big Piney were interested in such careers and classes than were Pinedale, perhaps reflecting Big Piney's previous experience with the industry.

Fit to the Boomtown Model

The growth in Sublette County, Wyoming from natural gas development offers a number of obvious similarities to the boomtown social disruption model, as well as a few obvious differences.

Local government Policy and Response

Local governments in Sublette County have to contend with a number of classic boomtown policy limitations, including: 1) jurisdictional unevenness between the affected governments (local) and the entity managing the development (federal); 2) a discrepancy between the immediate need for expenditure funds and a longer time frame for the adequate revenue to be collected, as is especially true in Pinedale; 3) revenues were primarily received by the Wyoming State government and Sublette County, however the revenues were also very much needed in the towns; and 4) local tradition and culture resisted attempts at mitigation. However Sublette County and the towns are receiving sometimes significant funds, which, of course, is much better than little to no funds at all. Indeed, the county government in particular has received adequate funds thus far, and is thus far able to mitigate a number of demands and even share the monies with the much poorer town governments on occasion. Local government limitations due to conflict among Sublette County residents and elected officials is also similar to previous boomtown research.

Economic Impacts

Economic Impacts from gas development have been disparate among different socioeconomic groups which appears to match the boomtown narrative. While the rising tide of wage increases has lifted all boats, boats tethered to the gas industry have been lifted quite a bit higher. For persons working in the retail or service industry, it is not known if the increases in wages have compensated for the severe increases in inflationary and cost of living pressures. Young workers, gas industry business owners, and property owners appear to benefit the most, while retired persons may have benefited the least.

Social Impacts

The broader social impacts found in Sublette County – such as decreased community satisfaction among old-timers, decreased social relations, social isolation of newcomers, etc. - follow a number of trends outlined in the research, although the research often paints a much bleaker picture than the one found in this area of Wyoming. Gilmore's 4 stages of boomtown growth have been closely mirrored among Sublette County residents as industrialization and growth increased, especially among residents of the Pinedale area.

Of particular interest regarding social impact is the perception among Pinedale residents that the growth and industrialization has been largely negative, while the towns of Big Piney and Marbleton see the growth as largely positive. One major difference between these two areas is that Big Piney and Marbleton have a long history of boom/bust growth associated with the energy industry (and many of the residents work in the industry), while Pinedale has had little to no direct experience with boom/bust or the energy industry.

Part Three: Implications for the Marcellus Shale

The Marcellus Shale formation stretches across a vast swath of the Northeastern United States and primarily includes areas of West Virginia, Ohio, Pennsylvania, and New York. Virginia and Maryland also contain some areas of the shale (See Figure 21, Page 45). The presence of the shale formation and the accompanying natural gas has been known for decades; however, recent technological advances in both seismic research and gas extraction have considerably increased both the estimated amount of gas contained in the shale and the amount that can be technically recovered.

Estimates of the resource size are still not proven and can vary widely. As late as 2002, the United States Geological Survey estimated the size of technically recoverable resource to be 1.9 trillion cubic feet (Milici 2005). Later estimates by geologic researchers have increased the total gas reserve to include as much as 500 trillion cubic feet, of which 50 trillion cubic feet may be recoverable (Gold 2008). (This latter estimate would make the Marcellus Shale region among the largest in the world).

The increase in the size of estimated recoverable resource, as well as advances in technology, increases in natural gas commodity prices, and successes in other shale regions, have contributed to an increased level of interest by natural gas extraction firms.

The Recent Demand for Natural Gas Drilling

On-shore natural gas development has expanded rapidly in United States since approximately 2001, as changes in commodity price and drilling technology have converged to make such development

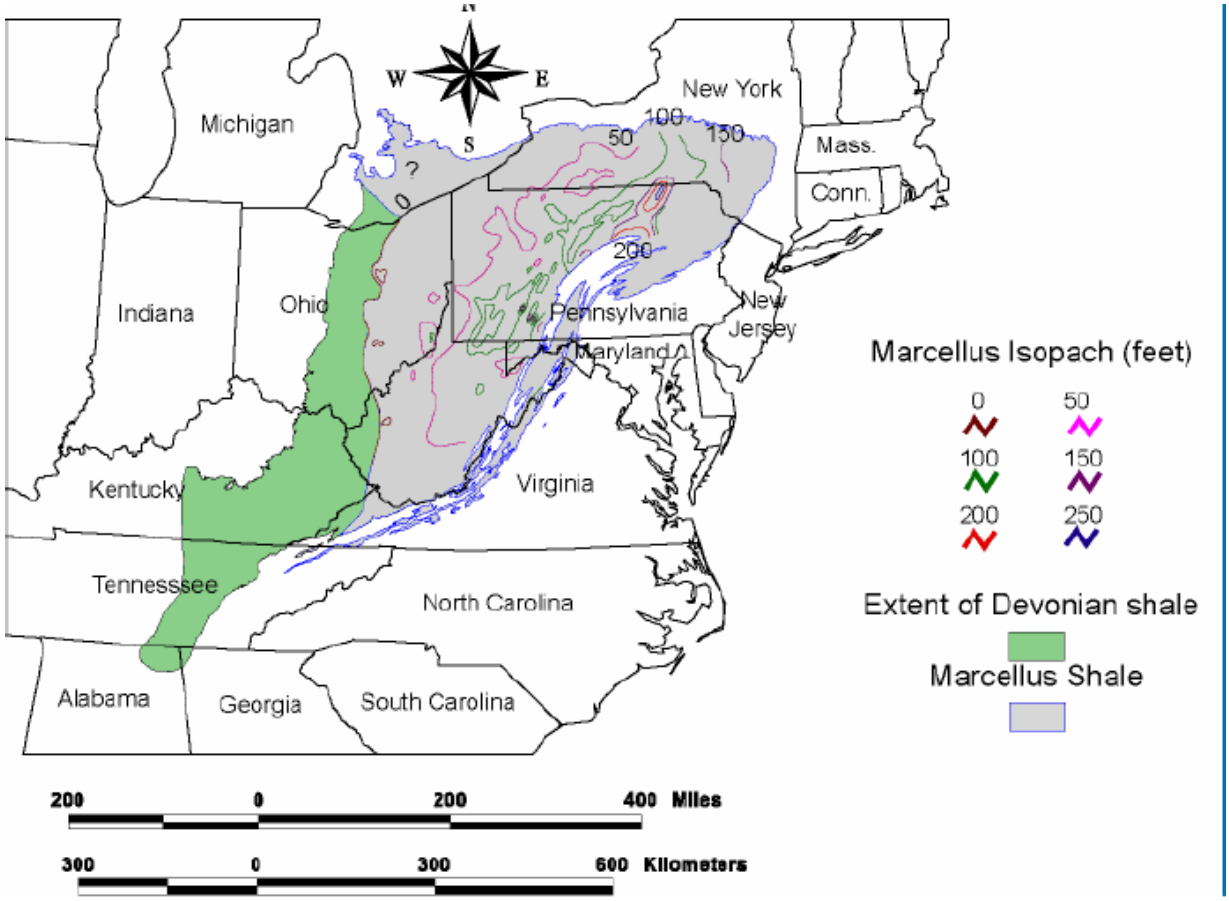


Figure 21: A Map Depicting the location of the Marcellus Shale Formation. From Milici, R. C. 2005

more attractive to energy companies.

Price

The commodity price for natural gas is the most important factor that decides the level of gas development and extraction. As the price increases, gas formations that were once considered unproven or risky are considered within reach or worthwhile risks. Most energy firms leverage the significant costs of drilling operations with the estimated price of the reserves owned or leased by the company. So an increasing commodity price will increase the amount of credit available to an energy company to develop a resource, as well as increase the return on that investment once the gas can be produced and sold at market.

Natural gas as a commodity is typically sold at the wellhead to a local collection pipeline com-

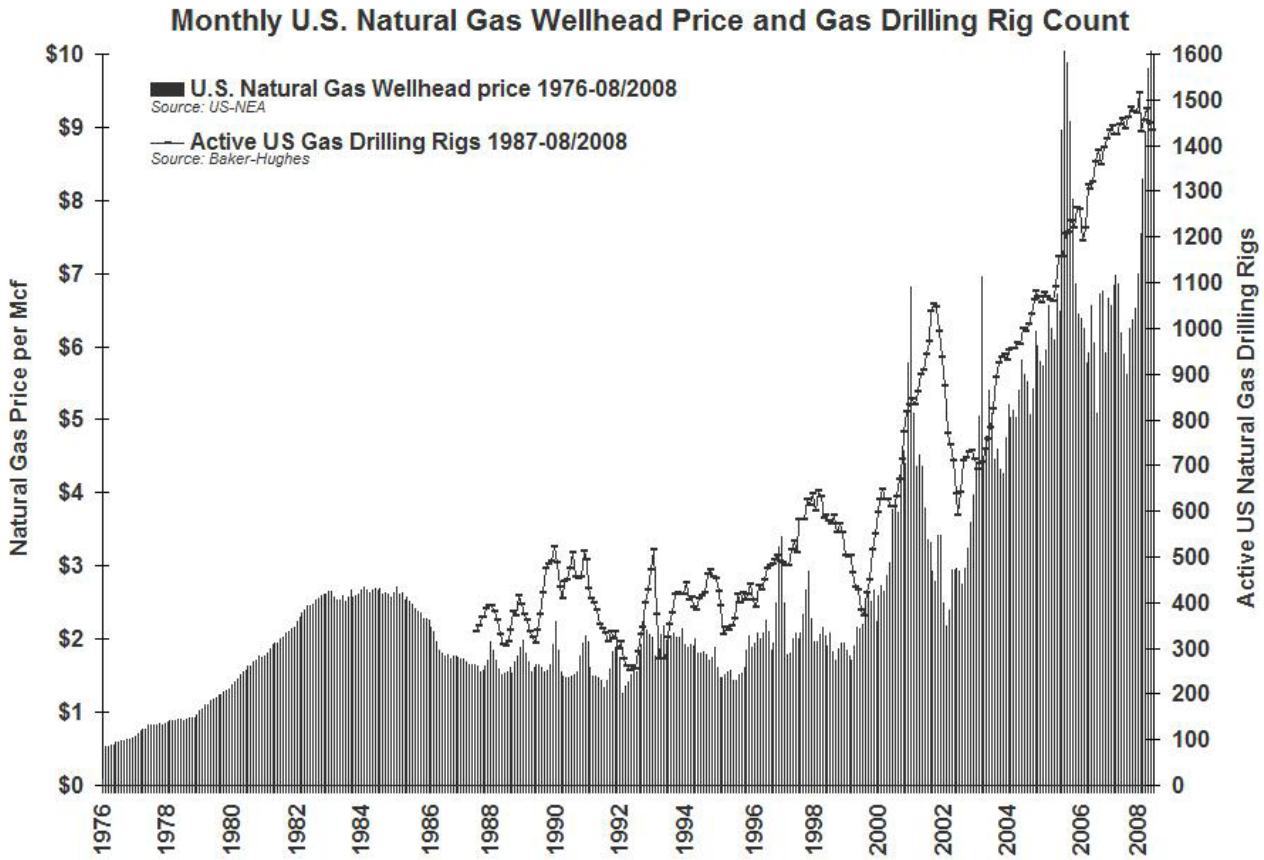


Figure 22:

pany who in turn sells the gas in bulk to larger transmission line companies down the line at hubs throughout the country, with two of the largest hubs including the Henry Hub in Erath, Louisiana, and the Opal Hub in Opal, Wyoming. Natural gas commodity futures are sold on the New York Mercantile Exchange, based on prices reported at the Henry Hub (Budzik 2002).

Overall, the commodity price is a factor of supply and demand pressures. Electricity generation, manufacturing, and home heating are increasingly relying on natural gas as a fuel source, which is increasing demand, and making the commodity price more susceptible to weather fluctuations (Wald 2008). Supply fluctuations in recent years have been primarily caused by hurricanes that have disrupted pipeline infrastructure in the gulf coast region. Policy shifts in energy use related to carbon reduction can be expected to increase demand for natural gas.

The increased price over time has now made expensive drilling methods ultimately cost-effective.

Two technologies became available in the late 1990s that allow for the profitable recovery of gas resources that have previously been physically or economically inefficient.

Directional or Horizontal Drilling

Instead of drilling straight down, directional drilling technology allows the drilling company to aim the drill bore in a certain direction or even drill horizontally, allowing for more flexibility in well placement and more precise downhole locations, thus ultimately increasing the amount of recoverable resource. With the technology, wells can be drilled under roads, buildings, mountains, sensitive habitats, etc. While experimental forms of directional drilling has been in limited use for decades, recent technological advances in the late 1990s such as rotary steerable technology (which allows the drill bit to be moved and aimed in any direction from the surface) has made the practice much more predictable and economical (Williams 2004). Single well pad locations have been developed that allow for up to 64 wells to be drilled from that single location and then branch out horizontally to 64 different downhole locations.

Hydraulic Fracturing or "Frac'ing"

Hydraulic Fracturing involves the pumping of liquids and other materials into the well at extremely high pressures that fracture the resource formation, and then hold these fractures open, allowing more of the resource to reach the well. This technology has been used with various rates of success throughout the years; however, in the mid 1990's the practice became much more advanced with the invention of superior fluid mixes. (Armstrong, 1995) The fluids are water or petroleum-based and are mixed with several molecular compounds to create an extremely heavy, viscous, and stable material. By the late 1990's, firms such as Halliburton had widely implemented the practice.

Applicability of the Boomtown Model to Marcellus Shale Development

As of early 2009, development of the Marcellus Shale is still largely in exploratory stages and the

eventual time frame, locations, and intensity of industrial activity are still unknown. However, an area of greatest potential is emerging in the shape of an arc from Southwestern to Northeastern Pennsylvania, as roughly represented by green lines inside the grey areas of Pennsylvania in Figure 21, page 45. This "fairway" area holds some of the deepest formations of Marcellus Shale and therefore some the highest pressured natural gas. This area will likely receive the greatest and quickest amount of development when compared to shallower regions in other states and elsewhere in the region. However, shallower regions are also likely to be developed by energy companies that hold leases only in these shallower areas, and some of these shallower areas are more convenient to nearby pipeline facilities. While the deeper areas will likely receive more development than the shallow areas, the actual level of development in either area is not yet known.

A timeline of development that estimates when the drilling phase of development will be completed is still not available. However, due to the tremendous resource potential, estimates of drilling in the Marcellus Shale for as long as 100 years have been posited (Watson 2008). However, even if true, a regional development phase of 100 years would still likely equate to boom/bust on the community level (or perhaps several different cycles of boom/bust) as interest in drilling near a particular community shrinks and grows along with economic, political, and technological considerations.

The boomtown model outlined here as well as the recent case study of natural gas exploration in Wyoming reveal a number of implications for the Marcellus Shale development. It is of course the case that a number of very significant social and economic differences exist between the Northeastern United States and the Western United States; however, it is also true that a number of similarities are also present. It is most important to keep in mind that the Marcellus Shale region itself contains wide diversity in population, demography, geography, government, and land ownership.

It is likely that social and economic impacts in the Marcellus Shale region from natural gas de-

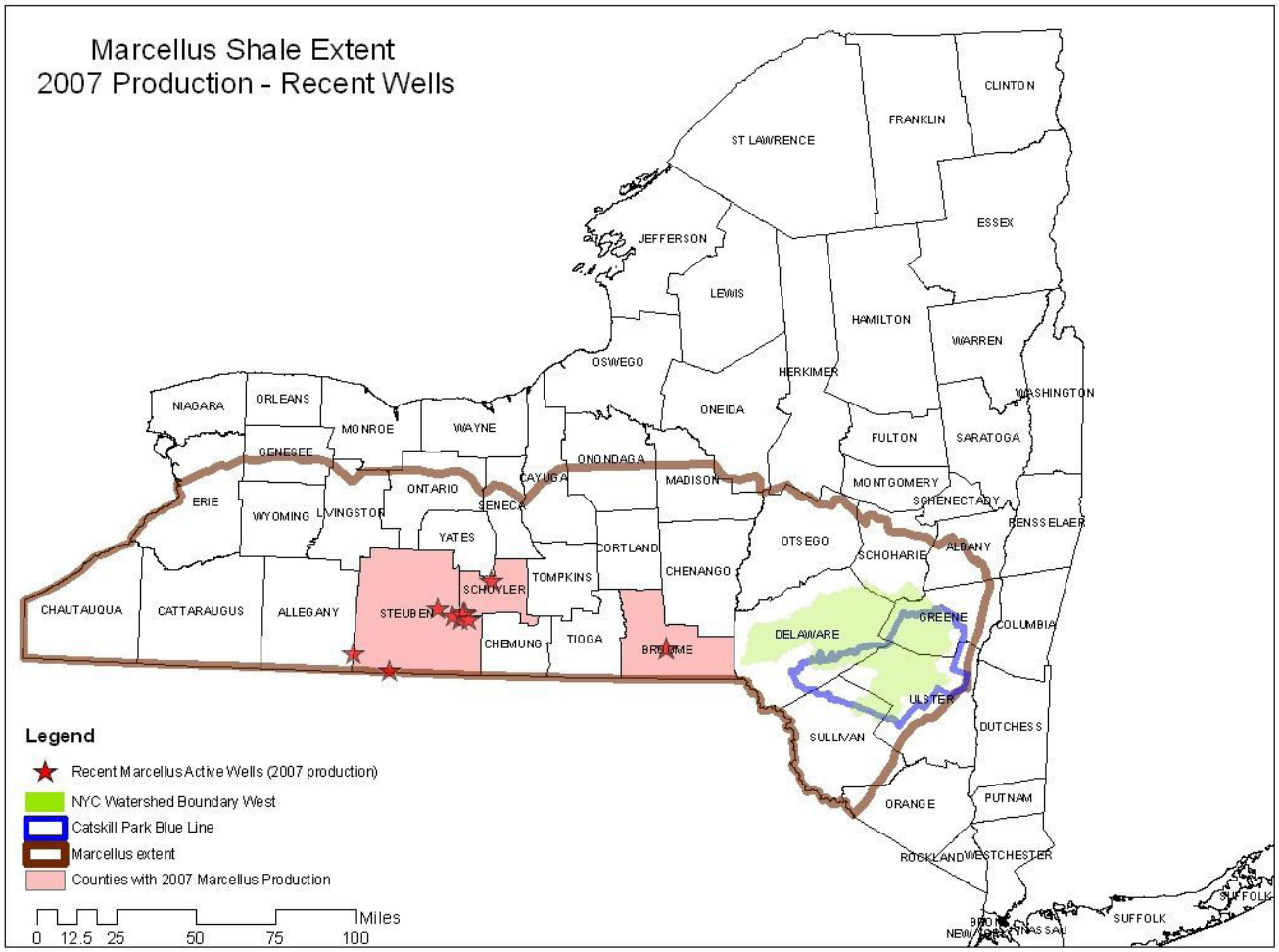


Figure 23: Source: NYDEC 2008

velopment will very much be location specific. Some locations will conform in many ways to the boomtown model and other locations will not.

A few of the important factors that will help determine the extent and type of change from the development are discussed below.

Population

The Marcellus Shale region encompasses an extremely large area that includes diverse arrays of demography: everything from extremely sparsely populated forests to major metropolitan cities are included in the area. However, the majority of the region is characterized as a rural web

of small towns interspersed with larger population centers. In contrast, western boomtowns are often one of a small few or even the only town within hundreds of miles of the extraction site and are often isolated economically and socially from other areas.

The boomtown experience is in many ways dependent on the ability of a community to absorb a population influx relative to the community's base population. It is likely that in most circumstances the larger the population of an impacted Marcellus Shale community, the smaller the overall impact will be on the community and local government. The population size threshold that will prevent disproportionate increases will depend greatly on the intensity of Marcellus Shale development which is currently unknown. In the Western United States, larger towns such as Rock Springs, Wyoming, Grand Junction, Colorado, and Farmington, New Mexico - each with populations between 30,000 and 50,000 - are currently considered natural gas boomtowns coping with a fair share of growth concerns. Meanwhile even larger cities such as Dallas/Ft. Worth and Denver have seen significant natural gas development without apparent negative consequences related to the growth.

Local Government

Additionally, local governments differ greatly in the Marcellus Shale region from the American West. The states of New York and especially Pennsylvania have many more layers of local government (such as townships and boroughs) than does the typical western model of a powerful county government, relatively weak town governments, and large swaths of land controlled by the federal government.

Eastern local governments form a mosaic of regulatory control and services, with over 2,500 local governments in the Commonwealth of Pennsylvania alone (PDCED 2008). It currently appears that local governments in the Marcellus Shale region will have few (if any) legal avenues to affect levels of natural gas development, yet such governments will still be asked to provide increased levels of services. Problems associated with the formalization of local governments, inconsistent

management approaches, and pushback from the conservative officials can be expected. On the other hand, perhaps the impacts will be spread out among the different governments and not create a demand disproportionate to the historical averages.

Historical Context

The historical experience of Marcellus Shale communities will of course differ from community to community, but will in any case hold a longer history than western boomtown communities. A longer and more storied history could cut both ways, however, as some communities may have experienced great change during that history, which can make residents more accepting of new changes, while other communities may have experienced very little change, which can make residents resist new changes. Residents of western boomtowns were often observed to expect little from local governments in comparison to the newcomers from other areas that expected a great deal more services from local municipalities. However, research on the basis for these expectations is very scarce, and while stereotypes may suggest that northeastern residents would be more reliant on and expectant of local governments, it is actually unknown what the governmental expectations of many rural residents of the Northeastern United States will be under periods of rapid growth and strain.

Many Marcellus Shale communities have some type of prior experience with mineral extraction, including natural gas, as well as coal, shale, and other minerals. The experience in Sublette County, Wyoming, was that the communities that have prior experience with mineral development are much more open towards new development and more accepting of the changes such development brings. The level of industrialization between the wells drilled historically in the region and Marcellus Shale wells is many levels of magnitude larger, as the Marcellus Shale requires significantly longer drill times, larger drilling rigs, hydraulic fracturing, larger workforces, and more advanced production equipment. Many residents may expect the Marcellus Shale development to resemble the relatively quick and easy drilling practices of earlier and shallower fields.

Land Ownership

Another critical difference is the nature of private land ownership in the Marcellus Shale region. The majority of the mineral estates in the Marcellus Shale are privately owned by the surface owner, while in the Western U.S. it is typically the Federal Government or a small handful of owners who own the estates. In the Marcellus Shale region, thousands of land owners will be affected, and many of them will have great financial incentive to support gas development on their land and within their communities. Furthermore, most landowners that see gas development on their property will be compensated with huge royalties that will reverberate throughout the community. To what degree this wealth will stay in the local community is still unknown and is a matter of great debate. What effect this wealth will have on non-landowners or community members dwelling in towns or cities is also unknown. A number of possible effects of local landowner mineral wealth can be imagined, from a renaissance of rural development driven by local wealth to rural flight among landowners among social conflict and environmental damage.

Implications for Local Government and Communities

It is clear that natural gas development has the potential to cause significant positive and negative impacts to local governments and communities. Whether that potential will be realized will depend on many things, especially the intensity and location of development.

While it is still very early in the development stage in most communities, based on the trends of impacts seen in other areas it is possible to identify several steps to prepare for energy growth pressures.

Organize Information and Oversight

Boomtown communities often suffer from a lack of clear information and oversight structure while being overwhelmed with new activity. Creating a community "task force" charged with providing a clearinghouse of information on the development as well as social and economic

impacts to local communities can aid in organizing and streamlining such information[1]. Producing a socioeconomic profile can help to identify "what is normal" for local communities, so that increases in demand for local government services can be noticed quickly once they occur. Such profiles can also identify the capacities and "problem thresholds" for local government services, as well as capacities and thresholds for private services ranging from ambulances to motel room capacity. Much of this information can be produced "in house", provided that staff or volunteers are available.

In addition to organizing information, a local task force that is comprised of members from several local governments or municipalities can help to establish communication, identify jurisdiction and authority over certain issues, and orientate local officials towards a new paradigm of growth and increased service demand A task force can reach out to energy companies who may be able to mitigate concerns in some areas, especially if it can be shown to benefit the energy company.

Pay Attention to Development Fluctuations and Scenarios

Local task forces can also play an important role at monitoring energy development and likely development scenarios. Natural gas development is often decentralized among several natural gas companies and therefore can be more difficult to monitor. Information such as drilling rig numbers and locations, well locations, permitting trends, production trends, and commercial, industrial, and residential real estate trends should be monitored. A community task force can reach out to local energy companies to keep abreast of changes in the development picture.

Produce Impact Projections and Mitigation Strategies

Once baseline information is identified, development has moved forward, and initial impacts have been observed, communities can begin to project the future impacts to demands for local

1 The Pennsylvania State University has created a useful document entitled *Marcellus Shale Exploration and Development: Organizing a Community Task Force* which is available online at: http://pubs.cas.psu.edu/FreePubs/pdfs/ua451.pdf

services, effects on economic sectors, social impacts, etc. Oftentimes new staffing, new equipment, and new facilities will be needed. Communities can begin to plan for new growth and identify the resources available. The expenses required to deal with increased demand can be estimated and mitigation plans can be developed to raise money and offset these expenditures in the form of fees, bond issues, etc.

Plan for the Long-Term

It is important to keep in mind that the construction or development phase of any energy project is temporary, and in the case of natural gas development even the production phase will last for only 30-40 years. Communities can plan for growth in the immediate future and mitigate that growth with projects, facilities, or services that will remain viable after energy-related growth has subsided or even reversed.

Bibliography:

Albrecht, S. L. 1978 "Socio-cultural Factors and Energy Resource Development in Rural Areas in the West" *Journal of Environmental Management* 7:73-90

Armstrong, K 1995. "Advanced Fracturing Fluids Improve Well Economics" *Oil Field Review* 6:3:34-51

Bacigalupi, L. M., and Freudenburg, W. R. 1983 "Increased mental health caseloads in an energy boomtown" *Administration and Policy in Mental Health and Mental Health Services Research* 10:4

BBC Research and Consulting 2007. "Garfield County Socioeconomic Impact Study" Garfield County. Colorado.

Blevins, A., Jensen, K. Coburn, M. and Utz, S. 2005. *Social and Economic Impact Assessment of Sublette and Sweetwater Counties For the Shell Exploration and Production Company*, Available online: http://sublette-se.org/files/SEPCoUWReport.pdf

Brookshire, D. S. and D'arge, R. C. "Adjustment Issues of Impacted Communities or, Are Boomtowns Bad?" *Natural Resources Journal* 20:523-546

Brown, B.S., 1978 *The Impact of the New Boomtowns : the lessons of Gillette and the Powder River Basin* Rockville, Md : U.S. Dept. of Health, Education, and Welfare, Public Health Service, Alcohol, Drug Abuse, and Mental Health Administration, National Institute of Mental Health

Brown, R., S. Dorius, and R. Krannich. 2005. "The boom-bust-recovery cycle: Dynamics of change in community satisfaction and social integration in Delta, Utah." *Rural Sociology* 70:28-49.

Brown, R., H. R. Geertsen, and R. Krannich. 1989. "Community Satisfaction and Social Integration in a Boomtown: A longitudinal analysis." *Rural Sociology* 54:568-586.

Budzik, P. 2002 "U.S. Natural Gas Markets: Relationship Between Henry Hub Spot Prices and U.S. Wellhead Prices" *U.S Energy Information Agency Issues in Focus* 2002

Bureau of Land Management (BLM) 2006. *Final Environmental Impact Statement, Jonah Infill Drilling Project, Sublette County, Wyoming* Cheyenne Wyoming: BLM Wyoming State Office Available Online: http://www.blm.gov/pgdata/etc/medialib/blm/wy/information/NEPA/pfodocs/jonah.Par.7761.File.dat/01volume1.pdf

Bureau of Land Management (BLM) 2008. *Final Supplemental Environmental Impact Statement, Pinedale Anticline Oil and Gas Exploration and Development Project, Sublette County, Wyoming* Cheyenne: Bureau of Land Management, Wyoming State Office Available Online: http://www.blm.gov/pgdata/etc/medialib/blm/wy/information/NEPA/pfodocs/anticline/fseis.Par.30367.File.dat/vol1_ea.pdf

Chalmers, J. A. 1977 "The Role of Spatial Relationships in Assessing the Social and Economic Impacts of Large Scale Energy Developments" *Natural Resources Journal* 17:209-222

Clemente, F. 1975 "What Industry means to a small town" *Farm Economics*

Coburn, M. 2008. *Community Satisfaction and Quality of Life Survey of Long-Term Residents of Sublette County* Big Piney, Wyo: Sublette Community Partnership. Available Online: http://sublette-se.org/files/FINAL_REPORT_CSQOL.pdf

Coburn, M. and Jacquet, J. 2008. A*nalysis of a 1% Special Purpose Sales Tax in Sublette County* Big Piney, Wyo: Sublette Community Partnership

Cortese, C. F. 1979. "The Social Impacts of Energy Development in the West: An Introduction" *The Social Science Journal* 16:2

Cummings, R. G. and Mehr, A. F. 1977 "Investments for Urban Infrastructure in Boomtowns" *Natural Resources Journal* 17:223-240

Davenport, J.A. and Davenport, J. III (Eds.) 1979 *Boomtowns and Human Services* Laramie: University of Wyoming

Davenport, J., III & Davenport, J.A. (Eds.) 1980 *The boom town: Problems and promises in the energy vortex* Laramie: The University of Wyoming,

Davidson, D. 1979 "Overview of the Boomtown Phenomenon and Its Effect on Women and Minorities" *U.S. Commission on Civil Rights Energy Resource Development* Washington, D.C.: U.S. Government Printing Office

Doran, Duff, M. K., and Gilmore, J. S., 1974. *Socio-Economic Impacts of Proposed Burlington Northern and Chicago North Western Rail Line in Campbell-Converse Counties, Wyoming* Denver: Denver Research Institute

Ecosystem Research Group (ERG) 2008. *Sublette County Socioeconomic Impact Study* Sublette County, Wyoming. Available Online: http://sublette-se.org/files/SubletteProfile11Feb08.pdf

Ervin, O. 1978 "Local Fiscal Effects of Coal Development: A Framework for Analysis and Management" *Policy Studies Journal* Vol. 7:1

Fahys-Smith, V. 1983 "Migration of Boom-town Construction Workers: the development of an analytic framework" *Environmental Geochemistry and Health* 5:4:104-112

Feldman, D. 1981 "Boomtown Women" *Environmental Action* May

Ford, A. 1976 "Summary description of the BOOM1 model" *DYNAMICA series*, Volume 4, Part 1 Los Alamos Scientific Lab., N.Mex. (USA) Available Online: http://www.systemdynamics.org/dynamica/articles/41/2.pdf Franklin, B. A. 1974 "What Price Coal?" *The New York Times* September 29th, 1974

Freudenburg, W. 1979 "An ounce of Prevention: Another Approach to Mitigating the Human Problems of Boomtowns" *U.S. Commission on Civil Rights Energy Resource Development* Washington, D.C.: U.S. Government Printing Office

Freudenburg, W. 1981 "Women and Men in an Energy Boomtown: Adjustment, Alienation, Adaptation" *Rural Sciology* 46:2:220-244

Freudenburg, W. 1982 "The Impacts of Growth on the Social and Personal Well-Being of Local Community Residents". In *Weber, B and Howell, R (eds.) Coping With Rapid Growth in Rural Communities* Boulder: Westview Press

Freudenburg, W. 1984 "An Overview of the Social Science Research" in McKell, C.M., Browne, D. G., Cruze, E.C., Freudenburg, W. R., Perrine, R. L., and Roach, F. (eds.) *Paradoxes of Western Energy Development: How Can We Maintain the Land and the People if We Develop?* Boulder: Westview Press.

Freudenburg, W. 1984b "Boomtown Youth: The Differential Impacts of Rapid Community Growth on Adolescents and Adults" *American Sociological Review* 49: October : 697-705

Freudenburg, W. and Gramling, R 1991 "Community Impacts of Technological Change: Towards a Longitudinal Perspective" *Social Forces* 1991:70:937

Freudenburg, W. and Jones, R. E. 1991 "Criminal Behavior and Rapid Community Growth: Examining the Evidence" *Rural Sociology* Vol. 54(4)

Gold, R 2008 "Gas Producers Rush to Pennsylvania : Promising Results There Spur Investment", *The Wall Street Journal,*

Gilmore, J. S. and Duff, M. K. 1974 *A Growth Management Case Study: Sweetwater County, Wyoming* Denver: Denver Research Institute. Available Online: http://www.sublette-se.org/files/case_study.pdf

Gilmore, J. S. and Duff, M. K. 1975 *Boom Town Growth Management: A Case Study of Rock Springs-Green River, Wyoming* Boulder: Westview Press

Gilmore, J. S. 1976. "Boom Towns may hinder energy resource development: Isolated rural communities cannot handle sudden industrialization and growth without help." *Science* 191:535-540.

Ives, B. and Eastman, C. 1975 *Impact of Mining Development on an Isolated Rural Community: The Case of Cuba, New Mexico* New Mexico State University Agricultural Experiment Station Research Report 301

Ivins, M. 1978 "A Discouraging Word Now Heard in Wyoming" *The New York Times* April 22nd, 1978

Jacquet, J. 2005. *A Geography of Second Homes in Wyoming 1990-2000* Master's Thesis, University of Wyoming, Department of Sociology

Jacquet, J. 2005b. *Sublette County Arrests and Index Crimes 1995-2004* Big Piney, Wyo: Sublette County Socioeconomic Analysis Committee. Fall 2005. Available Online: http://sublette-se.org/files/Unified_Crime_Report_2.0.pdf

Jacquet, J. 2006 *Sublette County, Wyoming: A Brief History of Drilling – The Socioeconomics of Gas* Big Piney, Wyo: Sublette County Socioeconomic Analysis Advisory Committee Winter 2006. Available Online: http://www.sublette-se.org/files/A_Brief_History_of_Drilling_2.2.pdf

Jacquet, J. 2006b *Sublette County Wage and Employment Study* Big Piney, Wyo: Sublette County Socioeco-

nomic Analysis Advisory Committee July 2006 Available Online: http://www.sublette-se.org/files/Sublette_County_Wage_Study.pdf

Jacquet, J. 2006c "How Many Out of Town Workers are there in Sublette County?" *Sublette Examiner* August 31st, 2006.

Jacquet, J. 2007a. *Housing and Real Estate Trends in Sublette County, Wyoming 2000 to 2015* Big Piney, Wyo: Sublette Community Partnership January 2007 Available online: http://www.sublette-se.org/files/real_estate_study.pdf

Jacquet, J. 2007b. *Sublette County Socioeconomic Impact Summary* Big Piney, Wyo: Sublette Community Partnership

Jacquet, J. 2007c. *Gas Industry-Related Classes: High School Student Survey Results* Big Piney, Wyo: Sublette Community Partnership. Available Online: http://sublette-se.org/files/Final_-_High_School_Classes_Survey.pdf

Jobes, P. C. 1987 "The Disintegration of Gemeinschaft Social Structure from Energy Development: Observations from Ranch Communities in the Western United States" *Journal of Rural Studies* 3:3
Kassover, J. and McKeown, R. L., 1981 "Resource Development, Rapid Growth, and Rural Communities: Managing Social Change in the Modern Boomtown" *Environmental Geochemistry and Health* 3:2

Kohrs, E.V., 1974. *Social Consequences of Boom Growth in Wyoming* Paper presented at the Rocky Mountain American Association of the Advancement of Science Meeting, April 24-26, 1974; Laramie, Wyoming. Available Online: http://www.sublette-se.org/files/Social_Consequences_of_Boom_Growth_In_Wyoming_-_Kohrs.pdf

Krannich, R., Berry, E.H., and Greider, T. 1989 "Fear of Crime in Rapidly Changing Communities: A longitudinal Analysis" *Rural Sociology* 54:2:195-212

Krannich, R. and T. Greider. 1984. "Personal Well-Being in Rapid-Growth and Stable Communities: Multiple indicators and contrasting results" *Rural Sociology* 49:451-552

Lantz, A. and Halpern, J. 1982 "Alcohol Use and Social Change: The Boom Town Experience" *Contemporary Drug Problems* 11:382

Lantz, A. E. and McKeown, Robert. L. 1979 "Social/Psychological Problems of Women and their Families Associated with Rapid Growth" *U.S. Commission on Civil Rights Energy Resource Development* Washington, D.C.: U.S. Government Printing Office

Leistritz, F. L., Murdock, S. H.., Leholm, A. G. 1982 "Local Economic Changes Associated with Rapid Growth" In Weber, B and Howell, R (eds.) *Coping With Rapid Growth in Rural Communities* Boulder: Westview Press

Little, R. L. 1977 "Some Social Consequences of Boom Towns" *North Dakota Law Review* 53:3:401-426

Longbrake, D. and Geyler, J.F. 1979 "Commercial Development in Small, Isolated Energy Impacted Communities" *The Social Science Journal* 16:2

Lovejoy, S. B. and Little, R. L. 1977 *Western Energy Development as a Type of Rural Industrialization: A Partially annotated Bibliography* Monticello, Il: Council of Planning Librarians

Lovejoy, S. B. and Little, R. L. 1979 "Energy Development and Local Employment" *The Social Science Journal* 16:2

Malamund, G. 1983 "Adjusting to Boomtown Living" *Chemical Engineering* August 22

Malamund,, G. 1984 *Boomtown Communities* New York: Van Nostrand Reinhold Company Inc.

Markussen, A. 1978. *Socioeconomic Impact Models for Boomtown Planning and Policy Evaluation* Presented at the Western Regional Science Association Meetings February 25, 1978.

Massey, G. and Davidson, R. 1983 *Corporate Involvement in the Transformation of Politics in Energy-Impacted Communities.* Paper presented at the Annual Meeting of the Western Social Science Association, Albuquerque, New Mexico, April 27-30, 1983. Available Online: http://sublette-se.org/files/Corp_Involvement.pdf

Massey, G. and Lewis, D. 1979 "Energy Development and Mobile Home Living: The Myth of Suburbia Revisited?" *The Social Science Journal* 16:2

Merrifield, J. 1984. "Impact Mitigation in Western Boomtowns" *Growth and Change*. 1:23-28

Milici, R. C. 2005. *Assessment of Undiscovered Natural Gas Resources in Devonian Black Shales, Appalachian Basin, Eastern U.S.A.* United States Geological Survey Open File Report 2005-1268. Available Online: http://pubs.usgs.gov/of/2005/1268/2005-1268.pdf

Moen, E. 1981. "Women in Energy Boom Towns" *Psychology of Women Quarterly* 6:1

Moen, E., Boulding, E., Lillydahl, J. and Palm, R 1981 *Women and the Social Costs of Economic Development: Two Colorado Case Studies* Boulder: Westview Press

Montgomery, J. 2008. *Land and Sales Statistics* Pinedale, WY: Sublette County, WY Office of the Assessor. Available Online: http://www.sublettewyo.com/assessor/StatisticsHome.html

Murdock, S. H., and Schriner, E. C., 1978 "Structural and Distributional Factors in Community Development" *Rural Sociology* 43(3)

Murdock, S. H., and Schriner, E. C., 1979 "Community Service Satisfaction and Stages of Community Development: An Examination of Evidence From Impacted Communities" *Journal of the Community Development Society* 10:01:109

New York Department of Environmental Control (NYDEC) 2008, *Large Map of the Marcellus Shale Formation* NYDEC Website, Accessed December 9, 2008. Available Online: http://www.dec.ny.gov/energy/46381.html

Pennsylvania Department of Community and Economic Development (PDCED) "Local Governments Online" www.newpa.com website, accessed December 6th, 2008.

Perdue, R. R., Long, P.T., Kang, Y S. 1999 "Boomtown Tourism and Resident Quality of Life: The Marketing of Gaming to Host Community Residents" *Journal of Business Research* 44:3:165-177

Peterson, I. 1985 "Wyoming Acts to Quell Boom-Time Upheavals" *The New York Times* Mar 12, 1985

Pinedale Anticline Working Group - Socioeconomic Task Group (PAWG-SETG) 2006. *Draft 2006 Final Report* Spring, 2006. Available Online: http://sublette-se.org/files/DRAFT--SETG_REPORT_06.pdf

Richards, B 1976 "Coal Plan Worries Clean N.D. Town" *The Washington Post*; Mar 2, 1976

Seyfrit, C 1988 "A Need for Post-Impact and Policy Studies: The Case of the "Shetland Experience" *Sociological Inquiry* 58:2:206-212

Summers, G., Branch, K. 1984 "Economic Development and Community Social Change" *Annual Review of Sociology*, 10

Susskind, L and O'Hare, M. 1977 *Managing the Social and Economic Impacts of Energy Development: Strategies for Facility Siting and Compensating Impacted Communities and Stakeholders*. Cambridge: Massachusetts Institute of Technology, Laboratory of Architecture and Planning

Staats, E.B. 1977 *Rocky Mountain Energy Resource Development: Status, Potential, and Socioeconomic Issues-Report To Congress by the Comptroller General of the United States* Washington, D.C.: General Accountability Office. Available Online: http://archive.gao.gov/f0402/102784.pdf

Stout-Wiegand, N., Smith, D. K., and Jallow, S. 1985 "Industrial Development in a Depressed Area: Male-Female Differences in Attitudes" *Northeast Journal of Agricultural and Resource Economics* Vol. 14: October.

Thompson, J. G. 1974. "Gillette Syndrome: Myth or Reality" *Wyoming Issues* 2:2:30-35 Available Online: htt p://sublette-se.org/files/Gillette_Syndrome_--_Myth_or_reality.pdf

Thompson, J. G. and Blevins, A. L. 1983 "Attitudes Toward Energy Development in the Northern Great Plains" *Rural Sociology* 48 (1)

United States Bureau of Labor Statistics 2008 *Wyoming State and County Employment and Wages (Quarterly Census of Employment & Wages – QCEW)* Generated October 24th, 2008

United States Census Bureau 2008a *Annual Estimates of the Population for Counties of Wyoming: April 1, 2000 to July 1, 2007* Population Division, Released March 20th, 2008. Available on line: http://eadiv.state.wy.us/pop/CO-07EST.htm

United States Census Bureau 2008b *Population Estimates by Age and Sex for Wyoming Counties: April 1, 2000 to July 1, 2007* Population Division, Released May 1st, 2008. Available Online: http://eadiv.state.wy.us/pop/CO_AS07.htm

United States Census Bureau 2008c *Annual Estimates of Population by Race Alone and Hispanic Origin for Wyoming Counties: April 1, 2000 to July 1, 2007* Population Division, Released August 7th, 2008. Available Online: http://eadiv.state.wy.us/pop/CO_RO07.htm

United States Census Bureau 2008d *Annual Estimates of the Population by Sex and Age for Wyoming Counties: April 1, 2000 to July 1, 2007* Population Division, Released August 7th, 2008. Available Online: http://eadiv.state.wy.us/pop/CO_AS07_GP.htm

United States Census Bureau 2008e *Annual Estimates of Housing Units for Counties in Wyoming: April 1, 2000 to July 1, 2007* Population Division, Released August 22, 2008. Available Online: http://eadiv.state.wy.us/pop/cty07hu-est.htm

Vlieger, R. W. 1985 *Social impacts of Coal Development in the Western United States* Masters Thesis, Ithaca: Graduate School at Cornell University

Wald, M. L. 2008. "Utilities Turn From Coal to Gas, Raising Risk of Price Increase" *The New York Times* February 4th, 2008.

Wall Street Journal (WSJ) 1975 "Boomtown Residents Show 'Futility, Despair'" *Wall Street Journal*, November 3rd, 1975 p. A1

Watson, R 2008 "Remarks made at the Pennsylvania Natural Gas Summit, Penn State University, State College, PA, December 17th, 2008"

Watson, K. 1977 "Measuring and Mitigating Socio-Economic Environmental Impacts of Constructing Energy Projects: An emerging Regulatory Issue" *Natural Resources Lawyer* 10:2

Webb, S., Krannich, R. and Clemente, F. 1980 "Power Plants in Rural Area Communities: Their Size, Type and Perceived Impacts" *Journal of the Community Development Society* 11:2:81

Wegner, N. 1978 "The Energy Boomtown: "An Analysis of the Politics of Getting" *The Policy Studies Journal* Vol. 7:1

Wieland, J. S., Leistritz, F. L. and Murdock, S. H. 1977 *Characteristics and Residential Patterns of Energy-Related Operating Workers in the Northern Great Plains* North Dakota State University Agricultural Experiment Station Agricultural Economics Report No. 123

Wieland, J. S., Leistritz, F. L. and Murdock, S. H. 1979 "Characteristics and Residential Patterns of Energy-Related Workforces in the Northern Great Plains" *Western Journal of Agricultural Economics* July

Wilkinson, K. P., Reynolds, Jr., R. R., Thompson, J. G. and Ostresh, L.. M. 1984 "Divorce and recent net migration into the Old West" *Journal of Marriage and the Family* 45:2:250-258

Wilkinson, K. P., Reynolds, Jr., R. R., Thompson, J. G. and Ostresh, L.. M. 1984b "Violent Crime in the Western Energy-Development Region" *Sociological Perspectives*, 27:2

Wilkinson, K., Thompson, J., Renyolds Jr, R., and Ostresh, L. 1982. "Local Social Disruption and Western Energy Development: A critical review" *Pacific Sociological Review* 25:275-296

Williams, M 2004. "Better Turns for Rotary Steerable Drilling" *Oil Field Review* 16:1:4-9

Wyoming Department of Administration and Information (WDAI), 2002. *Annual Population for Wyoming, Counties, and Municipalities: 1980 to 1990* Division of Economic Analysis, Released April 20th, 2002. Available Online: http://eadiv.state.wy.us/pop/c&sc8090.htm

Wyoming Department of Administration and Information (WDAI), 2008. *Wyoming Cost of Living for the Second Quarter 2008* Economic Analysis Division, Released September 30th, 2008. Available Online: http://eadiv.state.wy.us/wcli/NewsRelease-2Q08.pdf

Wyoming Department of Revenue 2005 *Total Distribution By Major Business Class and By County for the Fiscal Year: 2005* Report Date: 07/14/2005 Available Online: http://revenue.state.wy.us/PortalVBVS/uploads/FY2005%20Major%20Industry%20Code,%20Net%20Distribution%20by%20Major%20Business%20Class,%20.pdf

Wyoming Department of Revenue 2008 *Total Distribution By Major Business Class and By County for the Fiscal Year: 2008* Report Date: 07/17/2008. Available Online: http://revenue.state.wy.us/PortalVBVS/uploads/FY2008%20Major%20Industry%20Code%20by%20Month%20and%20Year.pdf