Natural Gas Drilling in the Marcellus Shale:
Potential Impacts on the Tourism Economy of the Southern Tier

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Introduction

The Marcellus Shale is a geologic formation that lies under large portions of New York, Pennsylvania, and West Virginia, and smaller parts of Ohio and Virginia. Contained within the Shale formation are reserves of natural gas, which have only recently become recoverable due to a process known as horizontal drilling and hydraulic fracturing ("fracking"). While estimates of the total untapped gas reserves vary widely, it is generally agreed that they are significant - as many as 500 trillion cubic feet of gas might be recovered from the formation, enough natural gas to meet the domestic needs of the United States for over 20 years (Engelder 2009).

Drilling in the Marcellus Shale has quickly become the center of controversy in New York; proponents argue that gas development could provide much-needed jobs, tax revenues, and royalties for land-owners, and would be a local source for a natural resource that accounts for 30% of New York's power consumption. Opponents argue that the fracking process poses a danger to the local and regional environment and threatens to contaminate the surface and ground water reservoirs that supply drinking water to cities and communities across the state.

While much of the debate over gas drilling in the Marcellus Shale focuses on the potential environmental impacts, there is also concern that gas extraction will create a "boom-bust" economic development pattern seen in many resource rich regions and countries (e.g. Jacquet 2009, Barth 2010, Christopherson 2011). Shale gas drilling in states like Wyoming, Texas, and Pennsylvania has had serious economic consequences for adjacent industries like agriculture and tourism, because of the widespread industrial activity that accompanies drilling.

This report centers on the potential impacts of gas drilling on the tourism industry in the three-county region served by the Southern Tier Central Regional Planning and Development Board (STC). Tourism is an important and diverse sector of the economy of the Southern Tier, and understanding some of the potential impacts of gas drilling on the tourism industry is important for business owners, elected officials, and planners concerned with economic development in the region. This paper addresses three major questions: 1) What is the value of the tourism sector to the economy of the STC region? 2) In what ways might gas drilling in the Marcellus Shale impact the tourism economy, now and into the future? 3) If gas drilling could

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potentially harm the tourism sector, what policies or strategies might help to mitigate those negative impacts?

This report is divided into four sections. After a brief introduction to the geography of the STC region and a description of the research methods used, the size and scope of drilling activity in the region is discussed. Next, a profile of the tourism economy is presented, including data on the economic impact of tourism and a discussion of the non-monetary importance of tourism amenities for quality of life in the region. Third, many of the potential impacts of gas drilling on the tourism economy are discussed. Finally, some recommendations for policy and planning are offered.

The STC Region

STC serves Chemung, Schuyler, and Steuben Counties, in the Southern Tier region of upstate New York. The region encompasses 2,151 square miles and has both urban and rural communities. It is home to several small cities and towns, including Bath, Corning, Elmira, Watkins Glen-Montour Falls, Hornell, and Wayland, as well as more than 2,300 farms (USDA 2007).

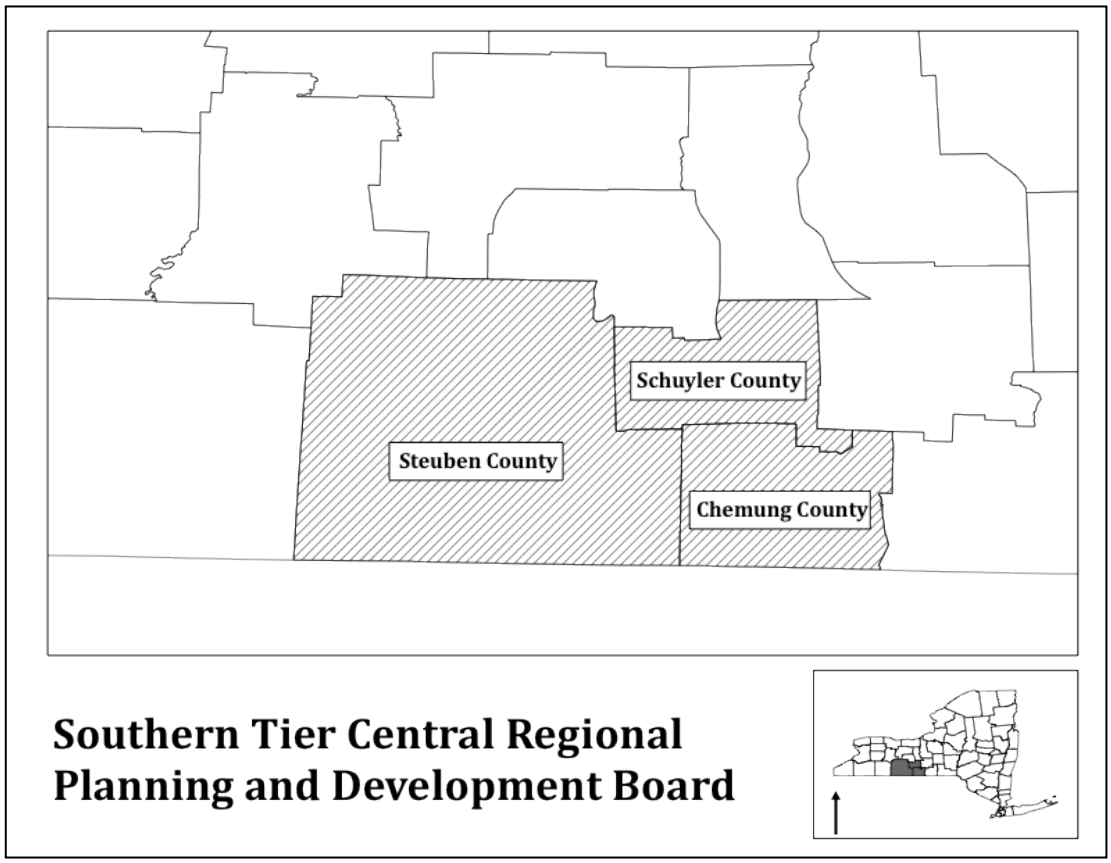

Figure 1: The STC region
Source: The New York State GIS Clearinghouse. Map created by author on 4/14/2011

Data and Methods

This report is based on information and data obtained from the following sources:

1. Published reports, news articles, and studies related to gas drilling in the Marcellus Shale
2. Data from the U.S. Census, the American Community Survey, County Business Patterns, and other sources for information relevant to gas drilling and tourism
3. Geospatial data from the New York State GIS Clearinghouse as well as agency sources
4. Interviews with public officials, gas drilling experts, organizations, advocacy groups, business owners and operators, and other local stakeholders (see Appendix A)

In addition, the report has greatly benefited from ongoing collaboration with the Marcellus Shale research team at Cornell University, led by Dr. Susan Christopherson in the Department of City and Regional Planning.

New York has issued a statewide moratorium on permits for hydraulic fracturing that lasts till at least August 2011, so drilling activity has yet to begin. Much of the analysis of the potential economic, environmental, and social impacts presented here and elsewhere is therefore speculative. In order to try and understand what may happen in New York should the moratorium be lifted, it is advantageous to study cases from other states and communities that have seen widespread shale drilling.

This report refers often to the Northern Tier of Pennsylvania, including Bradford County, for several reasons. First, the Northern Tier, and Pennsylvania generally, has seen widespread gas drilling since 2007, on a scale similar to what we might expect in New York. Second, compared to cases in Wyoming, Colorado, or Texas, northern Pennsylvania has a similar topography and environment to that of the Southern Tier of New York. Third, the Northern Tier economy has important agriculture and tourism sectors, similar to the STC region. One important difference between the two regions, however, is that the Southern Tier has several small cities, whereas Bradford County does not. The Southern Tier's urban assets may help shape the outcomes of gas drilling differently than what is seen in northern Pennsylvania.

Size and Scope of Drilling Activities

Though it is impossible to predict exactly how many gas wells will be drilled in the Southern Tier, given its location in the greater Marcellus formation, it is reasonable

to assume that drilling will be widespread in the STC region, especially in Chemung and Steuben counties.

Figure 2: The Marcellus Shale Formation
Source: The American Association of Petroleum Geologists

Natural gas drilling is certainly not new to the region. According to the Annual Report of the Division of Mineral Resources of the New York State Department of Conservation, Chemung, Schuyler, and Steuben Counties are all in the top 10 gas producing counties of New York State (NY DEC 2008; Barth 2010). As of 2008, Steuben County had 69 actively producing vertically drilled gas wells, while Chemung County had 43 and Schuyler County 18.

Though horizontal drilling and hydrofracturing are not permitted in New York, a number of conventional, vertical gas wells have been drilled or permitted in the New York portions of the Marcellus formation. According to the NYDEC, 80 permits have been issued for vertical gas drilling in the Marcellus formation in the STC (as of February 2011), 23 of which are currently producing gas.[2]

Horizontal drilling of the Marcellus Shale, however, is much different than the gas drilling traditionally done in New York State (Jacquet 2011). Because horizontal gas

[2] For the most up-to-date information available on well permits, well production, and volumes of gas produced, visit http://www.stcplanning.org/index.asp?pageId=153 and http://www.dec.ny.gov/cfmx/extapps/GasOil/search/wells/index.cfm.

extraction requires directional drilling and hydraulic fracturing, drilling will be a much more industrial process than traditional gas development done in the Southern Tier. Based on the development of other unconventional shales in the United States that required fracking, and on drilling activity in Pennsylvania thus far, the number of Marcellus Shale wells will likely far exceed the number of traditional wells in the region. Bradford County, PA, just across the state line, has seen a rapid proliferation in gas wells and well permits since 2007-2008:

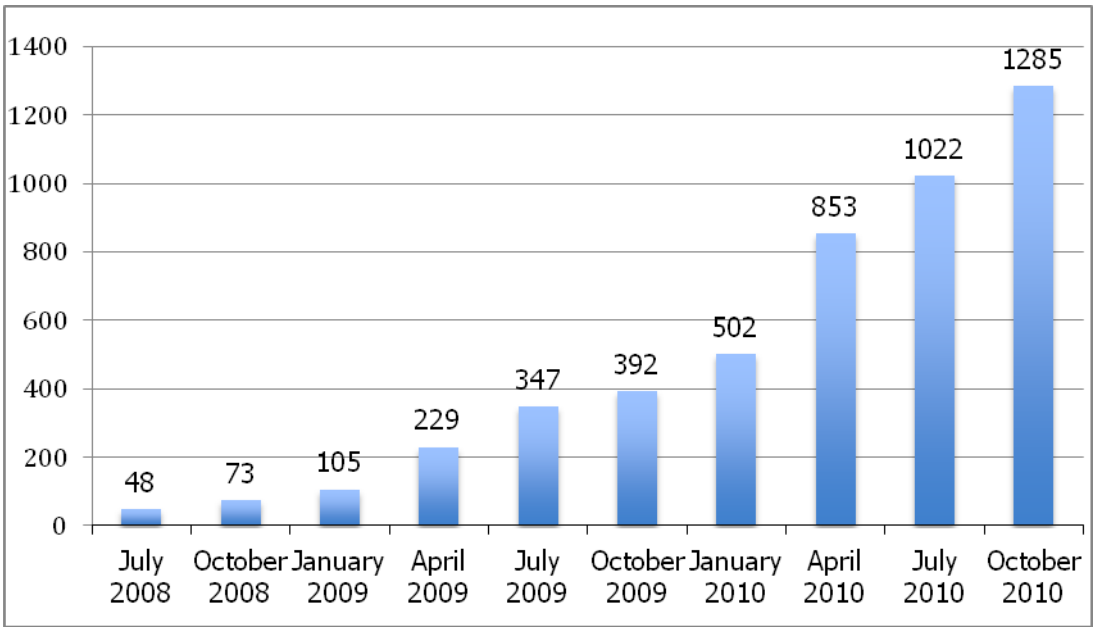

Figure 3: Permitted wells in Bradford County, PA (2008-2010)
Source: PA DEP, Bradford County

The proliferation of wells in Bradford County mirrors a trend happening in much of northeast and southwest Pennsylvania, and to a lesser extent, most of the state.[3]

The New York State Department of Environmental Conservation's (NYDEC) Draft Supplemental Generic Environmental Impact Statement (SGEIS) estimated that the maximum number of wells drilled per year in New York would be 500, though they do not describe how they reached that number (NYDEC 2009). In the three Pennsylvania counties south of the STC region (Tioga, Bradford, Susquehanna), energy companies were projected to drill double this amount in 2010 (Jacquet 2010).

A great many factors could influence the scale of drilling activity in the STC region, from state environmental policy and permitting processes to market demand and the availability of drilling equipment. Given the STC region's location in the

[3] Bradford County is above one of several "sweet spots" in the Marcellus formation under Pennsylvania, where gas production is pronounced. For an animated map of Marcellus shale permits issued in Pennsylvania statewide, see http://www.marcellus.psu.edu/images/well_animation.gif.

Marcellus fairway and its proximity to the equipment and labor force in Pennsylvania, it would seem prudent to plan for widespread drilling activity over the course of the next decade.

Tourism in the STC region

The STC region has a diverse range of tourism assets, both urban and rural in character. The Corning Museum of Glass, perhaps the most well known of the region's tourism destinations, attracts hundreds of thousands of visitors to Corning per year. The Wings of Eagles Discovery Center (formerly called the National Warplane Museum) in Horseheads, the Center for Mark Twain Studies at Elmira College, and the Watkins Glen International are among the many attractions in the region. The area is also known for its rural tourism destinations, like the National Soaring Museum, the Newtown Battlefield State Park, and many waterfalls, including Tinker Falls, Watkins Glen State Park, and Stony Brook State Park. There are a host of outdoor recreational and sporting venues in the region, from hunting and fishing to camping and bird watching. Seneca Lake in Schuyler County and Keuka Lake in Steuben County offer numerous boating and water sports opportunities.

The tourism "brand" of the Southern Tier is very much intertwined with agriculture; rolling hills, scenic farmlands, rural vistas, and viticulture are major contributors to the tourism draw here. Farmers markets, agricultural fairs, and family-owned restaurants can be found in almost every town and city. The Finger Lakes wine industry has rapidly become one of the most popular wine destinations in the eastern United States, with dozens of vineyards, tasting rooms, and bed & breakfasts that stretch from the Southern Tier counties to north of the Finger Lakes.

Supporting and growing the tourism sector is a key component of economic development strategies for the counties in the STC over the next several decades. Besides the significant tourism assets already in place, vineyards, viniculture, and wine tourism are a major focus for economic investment and growth.

Monetary and Non-Monetary Values of Tourism

Tourism is an important part of the present and future economy of New York. The importance of tourism for the STC economy is significant and growing. In 2008 visitors spent more than $239 million in the STC region, across a diverse range of sectors including food and beverage, lodging, retail and service stations, transportation, recreation, and second homes.[4] Visitor spending increased in all three STC counties from 2007-2008, year over year: by 10.6% in Chemung County, 2.9% in Schuyler County, and 12.8% in Steuben County (Tourism Economics 2009, p. 28).

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[4] Spending varied significantly across counties: Chemung ($89.2 million), Schuyler ($26.4 million) and Steuben ($123.5 million). See Tourism Economics (2009), p. 25.

Employment and Wages

The tourism and travel sector accounted for 3,335 direct jobs and nearly $66 million in labor income in the STC region in 2008. When indirect and induced employment is considered, the tourism sector was responsible for 4,691 jobs and $113.5 million in labor income (see Tables 1 and 2).[5] Tourism accounted for 1,923 direct, indirect, or induced jobs in Chemung County in 2008, or 7.2% of all jobs. In Schuyler County, tourism accounted for 562 jobs, or 11.7% of the total. In Steuben County, it accounted for 2,206 jobs, or 5.9% of all jobs.

Area	**Travel & Tourism: All Industry Groups 2008[6]**			
	Direct	**Total Jobs[7]**	**% Share (Direct)**	**% Share (Total)**
Chemung	1,421	1,923	5.0%	7.2%
Schuyler	389	562	8.1%	11.7%
Steuben	1,525	2,206	4.1%	5.9%
STC Region	3,335	4,691	4.7%	6.7%

Table 1: Direct and Total Employment in the Tourism Sector, 2008
Source: Tourism Economics (2009)

[5] To reach these figures, Tourism Economics used Regional Economic Information System (REIS) data from the Bureau of Economic Analysis, U.S. Department of Labor. To determine direct, indirect, and induced impacts of tourism on employment and wages, Tourism Economics used the INPLAN input-output model for New York State. For a complete description of data and methods, see Tourism Economics 2009 (p. 39).
[6] These statistics likely *underestimate* the value of tourism in the STC region, because they do not include vineyards and wine production, a major emerging industry in the area. See discussion following.
[7] Total jobs include direct, indirect, and induced employment. Direct employment is attributed to persons and companies directly providing goods and services to travelers. Indirect employment is secondary employment in the suppliers of goods and services to the direct employment companies. Induced employment is a share of the tertiary benefit to the local economy as incomes in the previous two levels of employment are spent on goods and services in the local economy. For example, when a restaurant employee spends his wages at the grocery store, it generates additional employment and economic output. See Tourism Economics 2009 (p. 39).

Area	Labor Income - Travel & Tourism 2008			
	Direct	Total	Share (Direct)	Share (Total)
Chemung	$27,255,000	$46,326,000	2.0%	3.4%
Schuyler	$6,639,000	$11,285,000	4.6%	7.9%
Steuben	$32,895,000	$55,912,000	1.9%	3.2%
STC Region	$66,789,000	$113,523,000	2.1%	3.5%

Table 2: Labor Income generated by the tourism sector, 2008
Source: Tourism Economics (2009)

According to the New York DOL, 93 individual firms operated in the Travel and Tourism sector in 2010. This does not include sole proprietorships, which may increase the number of firms by as much as 20% (see NYDOL (2011) and Tourism Economics 2009, p. 36).

Employment numbers for the tourism and travel industries exclude wine production and vineyards, because they are traditionally included in measures of the food processing sector of the economy. Wine and wine tourism is an emerging industry in the STC region, however, and employment in the industry is largely driven by tourism dollars. According to the New York State Department of Labor, 18 firms in the STC region were classified as "wineries" in 2010 and employed 275 people. An additional 8 firms were classified as "grape vineyards" and employed 63 people.[8]

Tax Revenues

Tourism is also an important source of revenue for state and local governments; in 2008, tourism in New York State generated more than $7 billion in state and local tax revenues (Tourism Economics 2009). In the STC region, the travel and tourism sector generated nearly $16 million in state taxes and $15 million in local taxes, for a total of almost $31 million in tax revenue. This equates to a tax benefit of $1,181 per household in the region.

[8] Estimations were made using data from the Quarterly Census of Employment and Wages (QCEW), in the 6-digit categories of Wineries (312130) and Grape Vineyards (111332).

Area	Travel & Tourism: All Industry Groups 2008			
	State Taxes	Local Taxes	Total	Region Share
Chemung	$5,805,894	$5,552,950	$11,358,844	36.9%
Schuyler	$1,761,258	$1,642,030	$3,403,288	11.1%
Steuben	$8,325,524	$7,693,489	$16,019,013	52.0%
STC Region	$15,892,676	$14,888,469	$30,781,145	100%

Table 3: State and Local Taxes generated by the tourism sector, 2008
Source: Tourism Economics (2009)

Discussion

Though the tourism sector creates a significant number of jobs in the STC region, it is likely that the value of gas drilling, measured simply by jobs created and wages generated, will exceed the value of tourism in the short term. It is also likely that many tourism related businesses, including hotels, restaurants, and shopping venues, would benefit from the influx of gas workers. These observations come with two major caveats, however.

First, tourism brings many non-monetary benefits to the STC region and its communities. Most important, tourism amenities improve the quality of life of residents. Restaurants, shops, parks and outdoor recreation areas, campgrounds, wineries, festivals, museums, and other related amenities are beneficial to local residents as well as visitors. These amenities also make a region more attractive for economic investment; they are some of the crucial resources that allow an area to attract economically mobile populations, like young professionals and retirees (Markusen 2003, 2004). The preservation and maintenance of rural and outdoor assets is also an important component of sustainable economic development strategies; these assets are a renewable resource for the region, and tourism creates a financial incentive to protect them.

Second, whereas many tourism related businesses are locally owned and operated and are thus part of a long-term economic development trajectory for the region, the employment "boom" in gas drilling will be relatively short-term and non-local (see Appendix B).

Tourism is a significant sector in the STC economy and one that is an important component of the long-term economic development in the region. At the same time, natural gas contained in the Marcellus Shale is an important and valuable resource

owned by the citizens of the STC counties, and its extraction could offer substantial benefits.[9] Based on these observations, two important questions emerge: 1) Will drilling have a negative effect on tourism and tourism development? 2) Can gas drilling and tourism co-exist?

The Potential Impacts of Gas Drilling on the Tourism Industry

One of the central questions confronting the tourism industry is whether drilling will permanently damage the carefully developed "brand" of the region, as a pristine and picturesque destination for wine lovers, outdoor enthusiasts, and budget conscious travelers. This question is different from asking if drilling will hurt the tourism economy generally. During the short-term drilling phase, the surge in out-of-town workers will likely benefit many tourism-related businesses. Gas workers will fill up hotels and motels, patronize restaurants, bars, and music venues, shop at local businesses, and so on.[10] But given the short-term nature of the drilling "boom," how might drilling and its attendant effects impact the tourism sector in the long run? In the next section, I discuss a number of ways that widespread natural gas drilling might transform the reputation of the region. Individually, they are unlikely to have serious and long-term consequences. Cumulatively, however, they threaten to do serious damage to the tourism sector by degrading visitor experiences and creating an industrial landscape that far outlives the profitability of gas extraction.

Accommodations[11]

An influx of out-of-town gas workers will likely strain the available supply of hotel/motel rooms, RV parks, campgrounds, and other short-term accommodations in the region. Given that many drilling-phase workers are transitory, they are less likely to purchase homes or avail themselves of long-term accommodations. As a result, even a few thousand workers can overwhelm the carrying capacity of rural communities and quickly tie up hotel rooms in much larger cities (Jacquet, personal communication 2011). For example, gas drilling has been a boon for hotels and motels in northern Pennsylvania, as occupancy rates have soared to over 95%, despite the nationwide recession. Some businesses, like the Towanda Motel in Bradford County, PA have become completely occupied by gas workers, and most have a significant gas worker presence.[12]

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[9] For a discussion of the short and long-term economic costs and benefits of gas development, see Christopherson and Rightor (2010).

[10] Based on drilling labor studies in Pennsylvania and other gas plays, many transient workers will support families that live out of state, and so their general spending habits are not directly comparable to local residents and workers.

[11] In addition to the strain placed on short-term lodging, an influx of gas workers might strain other tourism infrastructure such as shopping and eating establishments. See NPS 2009.

[12] Though not directly related to tourism, soaring hotel occupancy rates can also have a negative impact on social services and emergency management capacity. Hotel rooms are

The influx of gas workers tends to stress other types of short-term and affordable accommodations as well. Because the busy season for drilling is during the warmer months, many gas workers find accommodation in recreational areas, like RV parks, campgrounds, and vacation rentals. Unfortunately, this coincides with peak travel and tourism demand for the same amenities (for evidence from Wyoming, see Jacquet 2006).

Even as gas workers have filled these temporary accommodations across northern Pennsylvania, demand is still outstripping supply. Many hotels in the Southern Tier of New York are now housing gas workers, and Chesapeake Energy has recently completed a $7 million "man camp" in Athens Township, Bradford County, PA to alleviate the acute housing shortage (Rubinkam 2010).

For the tourism planners and officials, several major concerns have emerged. First, high occupancy rates in hotels, motels, campgrounds, and other locations make it more difficult for visitors to find accommodations. This is especially worrisome during major festivals and events, when a large influx of visitors is expected. For example, Pennsylvania hotels were forced to turn away attendees of the Little League World Series in 2010 (Beauge 2010). While some gas workers did temporarily vacate hotels to make room for Little League fans, there is no guarantee that the same will happen during future events. Uncertainty about the hotel and motel capacity of an area could plausibly lead to event organizers choosing alternative locations.

Demand for hotel rooms naturally leads to higher prices as well. While gas companies may be capable of absorbing higher prices for rooms, cost-conscious travelers may not, and may choose alternative destinations.

Second, hotel and motel operators report that gas workers are a different category of guest than the typical overnight businessperson or vacationing family, and can cause greater wear-and-tear on rooms and facilities. This is because 1) gas drilling is often hard, outdoor, physical labor, and workers return to their rooms with muddy or soiled work-boots and clothing; 2) gas workers spend larger amounts of time per day in their room than the typical overnight or weekend guest, as they are using the hotel as their primary residence in the region; 3) the rooms are often occupied by multiple workers simultaneously; and 4) workers often sleep in shifts, so the room is in continuous use.

Third, it is likely that hotel and motel companies will build additional capacity in the region to meet the growing demand from the natural gas workforce (either through hotel/motel expansion or construction of new locations.) There is a concern that such construction will leave the region with a glut of corporately owned hotel

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often used for temporary sheltering, and lack of availability has created problems in towns near gas plays (i.e. Jacquet 2006).

rooms once the "boom" period of drilling is over. An oversupply of rooms could lead to artificially depressed prices that could, in turn, make it difficult for bed and breakfasts and other independently owned businesses to compete and survive.

Room Tax

A second, and related, issue deals with the collection of room (occupancy) taxes. The room tax is collected on all hotel and motel room sales in New York State, and is levied at both the state and county level. At the county level, the rate and conditions of the tax are established by county legislatures but tend to be very similar. This tax is in addition to state and local sales taxes, which also may be added to the base price of a room.

Revenues from room taxes are crucial to the tourism sector in the STC region. They fund tourism development offices, including staff salaries and tourism promotion, and sometimes help to subsidize or incubate events. Revenues are also used to invest in, or pay down debt on, tourism facilities.

The key area of concern is the "permanent resident exclusion," a stipulation in both state statute and county ordinance that exempts individuals who occupy hotel/motel rooms for more than a threshold number of consecutive days (90 days for the state tax in New York, 30 days for most counties) from paying the room tax. This exclusion typically exempts the hotel resident from paying the tax for the *entire* period of their stay.[13]

In **Schuyler County**, the room tax rate is 4% (increased from 2% in 2005). The tax generated $242,446 in 2008 and $295,153 in 2009 and is projected to generate more than $325,000 in 2011 (Schuyler County 2011).

In **Steuben County**, the room tax rate is also 4%. The tax generated $685,368 in 2006 and $680,528 in 2007. In 2008, the last year that information is available, more than $700,000 in revenue was expected (Steuben County 2008). In 2007, room tax revenues supported a host of tourism development activities, including funding the Steuben County Conference and Visitors Center, the Finger Lakes Tourism Alliance, the Dairy Festival, the ARTS of The Southern Finger Lakes, and the Finger Lakes Wine Tourism Marketing Association (Steuben County Treasurer 2008).

In **Chemung County**, the room tax rate is 4%. According to the Chemung County Budget statement, revenues from the room tax have increased significantly in the past two years as a result of spillover from natural gas drilling activity in the northern tier of Pennsylvania, as well as from other corporate customers (particularly Sikorsky Aircraft). According to Chemung County officials, the natural

[13] Once occupants have achieved the "permanent resident" threshold of continuous days stay, the occupancy taxes levied on them prior to that point are refundable. See NYS DTF.

gas industry has "chosen [Chemung] County as a hub of operations" (Chemung County 2011). The tax brought in approximately $565,000 in revenue in 2010, and is expected to raise $700,000 in 2011.[14]

Gas companies who house their workers in hotels/motels often book the rooms in long-term blocks to take advantage of the exclusion. For example, in Wyoming County, PA, which is directly adjacent to Bradford County, PA, more than 50% of the hotel occupants were falling under the "30-day" exclusion in late 2010, and were thus exempt from the room tax. According to local sources, this was due almost entirely to the influx of gas workers. So, while gas drilling has been a boon for northern PA hotels in general, room tax revenues are lagging far behind where they would typically be with such high occupancy rates (Schillinger 2010). The same issue is likely to arise in the STC region, unless county room tax laws are changed.

Visual Impacts

Part of the appeal of the STC region as a tourism destination is the rural character of its landscape; rolling hills, pristine forests, and farmlands create incredible view-sheds across the area. There is great concern that drilling activity will mar this unique visual landscape.

The visual impacts of drilling are somewhat localized around the different sites associated with gas development: well pads, drilling rigs, compressor stations, water storage, gravel pits, equipment depots, water extraction sites, disposal areas, etc. Drilling rigs, which can reach heights of 150 feet or more, are the most visible signs of gas activity. From a relatively short distance, they stand in stark contrast to the surrounding environment. During the drilling phase, these rigs operate 24-hours per day, creating additional night-time impacts, including rig lighting and open flaring, which may degrade night-sky resources (see figure 3).

[14] Clearly, not all gas workers staying in Chemung County qualify for permanent residence exclusion, as tax revenues continue to rise. Whether revenues are keeping pace with occupancy, however, is an important question and difficult to answer with the data available.

Figure 3: Drilling rigs in Washington County, PA
Source: www.marcellus-shale.us

From a greater distance, however, drilling sites have less of an overall impact than might be feared. A visual impact assessment of drilling in Bradford County, PA in 2010 found that at distances of more than 0.5 miles, rigs became difficult to see in

the surrounding landscape (see Appendix D). In fact, other common manufactured features in the landscape, like power lines, cell phone towers, and windmills, can be more visually impactful than drilling equipment (Upadhyay and Bu, 2010). Beyond drilling, however, natural gas transportation infrastructure and storage facilities will also have a long-term visual impact. For example, pipeline construction can create deforestation, utility easement cuts, and possible decommission of agricultural land.

What is most important, however, is the *cumulative* impact of drilling activity across the entire STC region. The greater the extent of drilling, the more intense and pronounced the impacts will be on the visual environment. More wells drilled means more rigs, brine pits or the water treatment facilities that have begun to replace them, water storage, water extraction points, compressor stations, pipelines, newly cut access roads, heavy equipment storage, and dozens of other small impacts to the visual environment that combine to create an *industrial*, rather than scenic, landscape.[15]

Thus, the most important factors that will determine the visual impact of drilling sites, especially in scenic view-sheds, are 1) the overall levels of drilling activity; 2) the spacing restrictions between drill pads; 3) the distance of drilling sites from roadways, scenic overlooks, parks, vineyards, and other places visitors tend to go, and 4) the efforts made by drilling companies at the site of drilling activities, storage facilities, compressor stations, etc. Sites that are visually camouflaged, hidden from roadways, and quickly restored will have much less of an impact than those that are not (see Findings and Recommendations).

Truck Traffic

Truck traffic may be one of the most worrisome dimensions of gas drilling for tourism in the STC region. A typical well in the Marcellus Shale requires 5.6 million gallons of water during the drilling process, almost always delivered by truck (Randall, 2010). Trucks are also used to ship liquid additives to the well and to haul away flowback water. "Because of its weight, the impact of water [on roads, physically] hauled to one site (364 trips) is the equivalent of nearly 3.5 million car trips" (Ibid., p. 2). [16]

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[15] For additional photographs of visual impacts of drilling in Bradford County, PA and other locations, see Appendix D.

[16] There are new technologies for recycling flowback water on-site during the drilling phase that may help to eliminate a portion of truck traffic to and from the site; these technologies are not yet standard in the industry, however, though they are becoming more common in the northeast.

Truck traffic is at its peak during the drilling and hydro-fracturing of wells, operations that continue 24-hours per day for up to 2-3 weeks.[17] By one count, a vehicle arrived or departed an active drilling site in Bradford County *every 3-5 minutes* (Upadhyay and Bu 2010). A New York State Energy Research and Development Authority report estimates that for a single well, between 890 and 1340 18-wheeler truck trips are necessary, in addition to support vehicles, equipment transportation, and automobile traffic (NTC 2009).

Overall, truck and vehicle traffic is the least localized of drillings immediate effects, because the vehicles share the same infrastructure as citizens and visitors. Heavy truck traffic associated with drilling will likely have multiple negative effects on the STC region, and significantly degrade the tourism visitor experience. These effects will include: 1) heavier road traffic, on highways, secondary roads, and city streets; 2) increased air pollution; 3) increased noise pollution; 4) increased traffic accidents and safety risks; and 5) damage to roads, especially secondary roads (see Randall 2010).

Figure 4: Increased traffic congestion in Bradford County, PA due to Marcellus drilling. Source: Source: www.marcellus-shale.us

[17] This is for a single well; while multiple wells might be drilled per well pad, only a single well is drilled and fracked at a time.

Figure 5: Before and after photos of SR 3020 in Bradford County, PA, due to heavy truck traffic during the dynamic spring thaw. Source: PA DOT.

Hunting, Fishing and Outdoor Recreation

Hunting, fishing, and other outdoor recreation contributes more than $6 billion to the New York economy annually, and are important components of the tourism economy in the STC region. Outdoor recreation and sporting amenities are also valuable assets for STC residents, improving the quality of life for families and communities.[18] Without proper planning, widespread drilling in the Marcellus Shale will likely have numerous negative impacts on waterways, forests and open space, and as a result, on hunting, fishing and other outdoor activities, as well as on the businesses that support them.

Gas drilling introduces significant human activity to rural land, from new roads and truck traffic to noise and pollution. As a result, native habitats and ecosystems may be disturbed, possibly for years after the end of drilling activities. In Sublette County Wyoming, for example, drilling activity in the Jonah Field and the Pinedale Anticline has disrupted the migratory patterns of antelope, mule deer and other indigenous species, with herds down as much as 50% in the past decade (Albert 2011). As a result, non-resident licenses for mule deer have fallen from 1,400 to 800. Gary Amerine, owner of Greys River Trophies in Daniel, Wyoming, says that non-resident hunters are going other places, because of the diminished opportunities. Sportsmen for Responsible Energy Development document similar stories from across the western states, where natural gas development has been in full swing for close to a decade (SRED 2009).

[18] For a map of state parks, historic sites, waterways, and other outdoor and recreation facilities, see Appendix C.

Drilling activity also threatens fishing and other stream, lake, and water recreation. Chief among the concerns is water pollution due to spills, accidents, and runoff during the fracking process. Accidents in Pennsylvania have already caused limited fish kills and waterway contamination; for example, more than 8,000 gallons of drilling fluid were spilled near Dimock, PA in 2009, leading to water contamination and a fish kill in nearby creeks (see Lustgarten, 2009). In 2011, a well blowout in Bradford County, PA led to several thousand gallons of drilling fluids to flow onto nearby farmland and streams and prompted the evacuation of eight families from the area (Legere 2011). Even if spills and accidents are minimized, clearing thousands of well pads will affect runoff patterns, which may disrupt fish and aquatic habitats. Another concern is the extraction of fresh water needed for drilling. In many rural areas, the only available water sources are streams, creeks, and lakes, and conservationists worry that too much extraction will endanger waterways and fish populations (for example, see Licata 2009).

Widespread gas drilling will likely have a negative impact on outdoor amenities generally. The National Park Service (NPS) warned in a recent report that shale-gas development and its attendant industrial activity may degrade visitor experience by negatively impacting air, water, and sound quality, affect night sky resources, and strain tourism infrastructure such as shopping, lodging, and eating establishments (NPS 2008). Such impacts could negatively affect visitor levels, especially if drilling occurs near park boundaries or is allowed to occur inside of parks or state forests.[19]

One critical variable in the level of impact of drilling on outdoor amenities in parks or forests is whether the State of New York allows drilling within them. In Pennsylvania, the state has only recently begun to allow drilling permits within parks, which has sparked widespread controversy (e.g. Gilliland 2011). While proponents argue that gas resources under state-owned lands is a valuable commodity and a boon to the economy, organizations like the Sierra Club worry that drilling will damage or destroy some of state's most valuable outdoor resources. Similar debates are bound to take place in the STC counties, given the number of parks and forests within the vicinity.[20]

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[19] Many of the region's recreational resources are contained in state parks, managed by the Office of Parks, Recreation, and Historic Preservation, and state forests, managed by the DEC. While drilling in state parks is less likely, drilling already occurs regularly in state forests, which are also managed for other resources like timber and game (Hautaniemi 2011).

[20] Historically, New York State has allowed some gas drilling, storage, and infrastructure within state parks; for example, Allegany State Park contains gas storage ponds, a portion of a natural gas pipeline, and a compression station. The gas stored is used locally by the park and industry as well as transported through the pipeline to customers in New York and Pennsylvania. So, while gas development has taken place within parks, the caveat remains that horizontal drilling and fracturing is a more industrial process than traditional drilling.

Labor Supply

While most drilling phase gas workers will be non-local, planners still worry about the overall supply of labor in the STC region. Many of the tourism assets and facilities in the region, including the burgeoning numbers of vineyards, the Watkins Glen International, hotels/motels. Bed and Breakfasts, RV campgrounds, restaurants, and other service-related businesses, already face a challenging labor environment and struggle to fill lower-wage and temporary positions. Two key concerns emerged when talking with economic development planners and business owners. First, will the gas drilling labor market put additional strains on the labor supply by offering better paying jobs than tourism related businesses can afford? From an economic development perspective, better paying jobs are generally seen as a plus. From a small business owner perspective, however, there is worry that paying workers higher wages to compete with gas companies is not economically feasible. Second, will the opening of additional hotels, restaurants, and other service related businesses, to meet the demand of gas workers, be possible given the limited labor supply in the region?

Discussion & Recommendations

The Cumulative Impacts of Drilling

In order to gauge the true impact of gas drilling in the Marcellus Shale on tourism and tourism development, we need to look at the cumulative impact of drilling across the STC region. Individual gas wells and drilling activity, while disruptive at a local scale, will likely have very little impact on the tourism sector. Cumulatively, however, the regional industrialization associated with widespread drilling could do substantial damage to the region's "brand," threatening the long-term growth of tourism here. Increased truck traffic, automobile traffic, air pollution, noise pollution, and industrial accidents, decreased availability of hotel/motel rooms, campground spaces, and RV parking, negative visual impacts from multiple drilling rigs in rural view-sheds, storage facilities, gravel pits, and compressor stations, disruptions to wildlife and hunting grounds, fears over lake and stream pollution and many other associated impacts of drilling will change the character of the region from pristine and rural to gritty and industrial. If so, the region's ability to attract tourism may be damaged in the long-term, as the perception (and reality) of the region as an industrial landscape may far outlast the employment and monetary benefits of gas drilling.

The Pace and Scale of Gas Drilling are Crucial

The pace and scale of gas drilling will be a crucial determinant of the overall impact on the tourism economy in the Southern Tier.[21] Nearly every negative impact of drilling discussed here could be more or less disruptive depending on the pace and scale of drilling; fewer permits per year means a lower volume of truck traffic on primary and secondary roads, fewer visual impacts and less chance of multiple rigs in view-sheds, an increased but not overwhelming demand on hotel rooms and short-term accommodations, fewer pressures placed on the local labor supply (and more time to train a local workforce to take advantage of drilling phase jobs), and so on.

There are natural determinants on how widespread drilling will be in a particular county or town, mostly around the performance of wells in that area. The most productive Marcellus wells tend to be in the "fairway," the deepest and most highly pressurized areas of the Shale and the most promising area for gas exploration (CCE 2009). In the STC region, Chemung and Steuben County will likely see more gas drilling activity than Schuyler County, at least initially, because of their location relative to the fairway. There are some industry-side constraints on pace and scale as well, like the availability of drilling equipment and work crews.

Despite similar natural and industry constraints, Pennsylvania is currently experiencing the effects of rapid and widespread drilling activity. The landscape has quickly shifted from rural and agricultural to industrial. In addition to these physical changes, Bradford County, PA officials are also struggling to cope with an increase in rents, 30% more emergency calls, rising traffic, and busier courts and jails due to increased drilling activity, all without an increase in associated funding for services (Legere 2010).

The natural gas that lies beneath the STC region will remain there until drilling occurs, and once it occurs, the region will have just one chance at maximizing the long-term benefits of such a valuable natural resource (Christopherson 2010). If drilling is to occur, a slower and more deliberate approach seems to be the most prudent path; from the perspective of tourism and tourism development, a controlled pace of drilling should be far preferable to the pace and scale of activity in places like Pennsylvania and Wyoming.

Local Governments Have the Tools to Mitigate Some Drilling Impacts

Municipal and County governments have many tools at their disposal to help mitigate the impacts of gas development. Municipalities have the ability to regulate many of the industrial developments associated with gas drilling, like drilling rigs,

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[21] Pace refers to the time frame within which gas extraction takes place; scale refers to the number of wells drilled in the region annually (Christopherson and Rightor, 2011).

compressor stations, pipelines, water storage, gravel pits, equipment depots, water extraction sites, and waste disposal areas. Regulations may be imposed through comprehensive planning and zoning, or during the site planning process. These regulations might address the location, size, appearance, or operation of gas related infrastructure, buildings and sites, and should be developed and passed with the intention of mitigating the impacts of gas development on tourism as well as other economic sectors and the local environment.

Municipalities approving large development plans related to industry, such as hotels, motels, man-camps, and office buildings, should include conditions regarding possible changes to design and use after drilling activity ends. Advanced planning for local needs will help maximize the utility of these investments in capital and infrastructure for the needs of local residents in the long-term.

Municipal governments can also ensure that when gas leases are drawn up, drilling companies are required to restore and make improvements to the well pad and drilling site at the end of the lease. Site restoration can help ensure that the visual impacts of drilling are minimized at the end of the drilling phase.

With regards to the impacts on roads and traffic congestion, it is important that governments conduct a comprehensive truck traffic impact study and document baseline road conditions that would calculate the monetary value of remaining road life. Governments should consider developing road use agreements (RUA) at the time of permitting that would require operators to offset the predicted loss of life of roadway infrastructure (for details, see Randall 2010). Municipalities should also consider developing systems for route management, including agreements on by-pass routes that would serve the industry while relieving pressure on heavily trafficked roads.

Changes Are Needed in the Room Tax

The permanent resident exclusion in the room tax laws of the STC counties is an area where immediate action could be taken to protect the resources necessary for tourism promotion and development. Even if tax revenues increase from gas drilling business, they will likely not keep pace with overall occupancy levels, as is the case in Bradford County, PA (see above). These additional revenues will be crucial resources for tourism promoters as they struggle to counteract the negative impacts of gas drilling. Counties should eliminate the permanent resident exclusion in room tax laws, in order to capture all revenues associated with hotel and motel room sales.

Before counties make changes to their room tax laws, however, two points should be considered. First, changing the law might negatively impact some businesses that use the exclusion when housing short-term employees. For example, Corning Incorporated houses their summer interns in local hotel rooms and benefits from permanent resident status. It is worth explaining to them the greater community

benefit to be gained from eliminating the exclusion. Second, changing the law will likely negatively impact low-income individuals and households who rely on daily or weekly hotel/motel rentals as their primary option for housing, as well as protective housing agencies and emergency services organizations (e.g. the Red Cross) that house displaced families in hotel and motel rooms. Appropriate measures should be taken to ensure a supply of temporary housing for those agencies and to protect vulnerable populations from sudden housing price increases.

Common Sense Measures Will Reduce the Visual Impacts of Drilling

Some common-sense steps in site design and operations should be taken by the gas companies to reduce the visual impacts of drilling activity. Drilling rigs, pads, compressor stations, wellheads, retention ponds, and other drilling equipment can be camouflaged or hidden from view. Compressor stations that have structures built around them produce much less noise pollution. Equipment and buildings that are painted in natural colors are much less visually intrusive than those that are not (see figure 3). Drilling pads and equipment can be hidden from view of the road through the construction of earthen berms, which also protect against wastewater spills and reduce overall levels of noise pollution. Well pads that are quickly and carefully restored also take less of a visual toll. Many of these measures could be included in regulations developed by local governments.

Tourism Firms and Organizations Should be Proactive

Tourism businesses and related organizations and agencies (e.g. Chambers of Commerce) should take steps to mitigate the impacts of drilling and attendant influxes of gas workers. Given that other gas drilling areas have seen a dramatic decrease in the availability of hotel and motel rooms, businesses and agencies can begin working to secure agreements with hotels and other lodging establishments to reserve a percentage of rooms for non-gas related customers during annual festivals and other large tourism events, when demand reaches its peak. If gas drilling in the STC region does proceed, the tourism sector will have the opportunity to access new markets. Tourism development strategies that successfully target gas workers and their families will capture and keep local some of the gas revenues that otherwise would leave the region, and might help to alleviate some of the insider-outsider tensions that are prevalent in other gas producing regions.

Appendix A: Information on Qualitative Interviews

In addition to the economic, spatial, and comparative research referenced in the above report, I consulted with the following individuals and organizations who were generous with their time and expertise related to tourism and/or gas drilling:

- Marcia Weber, Executive Director of Southern Tier Central Regional Planning and Development Board
- Susan Christopherson, Professor of City and Regional Planning at Cornell University
- Christian Harris, Labor Market Analyst at the New York State Department of Labor
- Jeffrey Jacquet, PhD candidate in the Department of Natural Resources at Cornell University
- George Frantz, Principal at George R. Frantz & Associates
- C.J. Randall, Cornell University
- Tom Knipe, Cornell University
- Peggy Coleman, President of the Steuben County Conference & Visitors Bureau
- Fred Bonn, Director of the Ithaca / Tompkins County Convention & Visitors Bureau
- Andrew Zepp, Executive Director of the Finger Lakes Land Trust
- Danielle Hautaniemi, Director of Planning & Community Development for Cornell Cooperative Extension, Schuyler County
- Meghan Thoreau Jacquet, Planner at Southern Tier Central Regional Planning and Development Board

I also spoke with several small business owners in Bradford County, PA, all of whom wished to remain anonymous in the findings of this report. I thank them for their participation.

Appendix B: Employment in the Gas Drilling Industry

The vast majority of the employment generated by natural extraction is concentrated in the "drilling phase," a labor intensive period where well pads are cleared, drilled, fracked, and restored, and gas pipelines are laid. A recent study of drilling in Pennsylvania, for example, found that the drilling phase accounted for 98% of the gas industry workforce (MSETC 2009, MSETC 2010). Depending on the overall pace and scale of drilling and the production performance of wells, the "drilling phase" will likely last 10-15 years. Because job growth is so concentrated in this relatively short drilling phase, and because drilling activity can quickly increase and decline in a given area, natural gas development can conform to a pattern of boom and bust observed in other types of natural resource development activities (Jacquet 2009, Christopherson 2010).

As compared to local tourism employment, job growth from drilling in the STC region will likely benefit mostly non-local workers. During the drilling phase, many of the 1150 full time equivalent (FTE) local positions created per 100 wells will go to drilling crews coming from outside the region (Jacquet 2006, 2011). In Pennsylvania, for example, the Marcellus shale industry has relied heavily on "out-of-town" workforces to meet their needs (Jacquet 2011). While "production phase" jobs tend to be longer term, locally hired, and well paid, they represent only a small portion of the overall natural gas workforce.

Not surprisingly, across the United States, job growth from gas extraction is concentrated in states where energy companies are headquartered, as engineers, lawyers, corporate managers, and consultants tend to cluster in those cities and states (see figure 2).

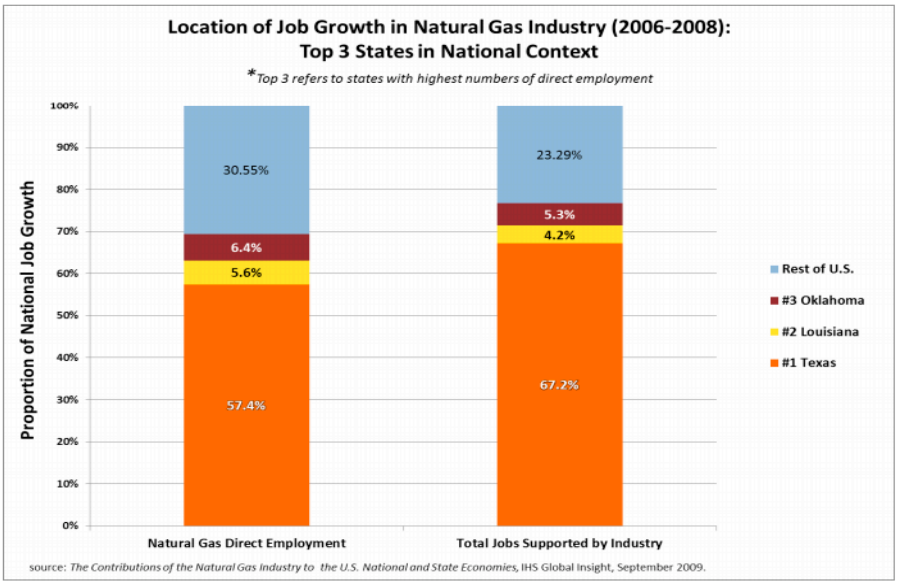
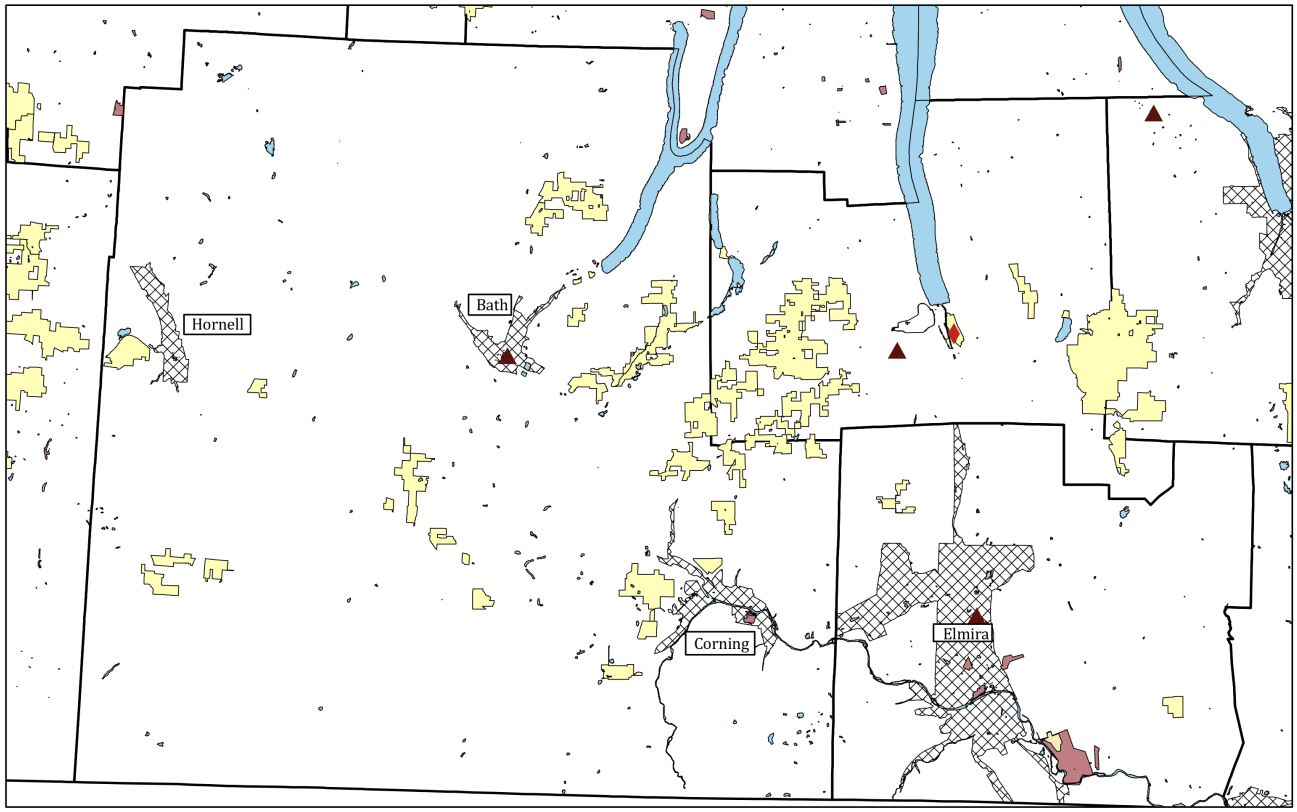


Figure 2: Location of Job Growth in Natural Gas Industry 2006-2008
Source: IHS Global Insight (2009)

Appendix C:



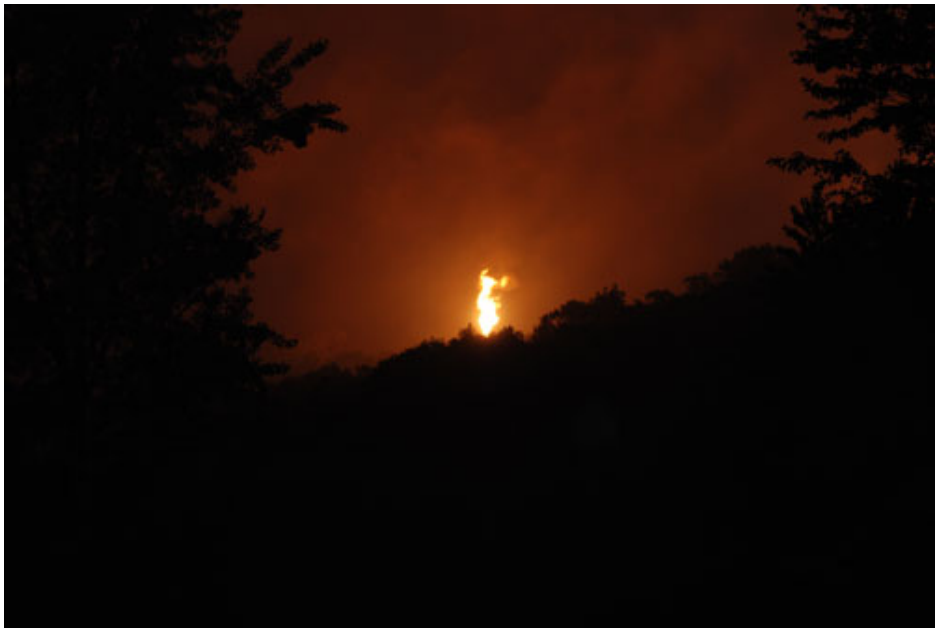
Parks, Waterways, Outdoor Recreation Land and Other Amenities in the STC

Legend

- Bird Conservation Areas
- Fairgrounds
- CountyRecreation
- State Parks & Historic Sites
- Waterways
- State Recreation Land
- Urban Areas

Appendix D: Visual Impact Images[22]

Water impoundment site



Nighttime "open flaring" of a gas well

[22] All images are from Bradford County, Pennsylvania and are courtesy of George Frantz, Sarita Rose Upadhyay and Min Bu (2010).

Water Withdrawal Site

Gas Compressor Station

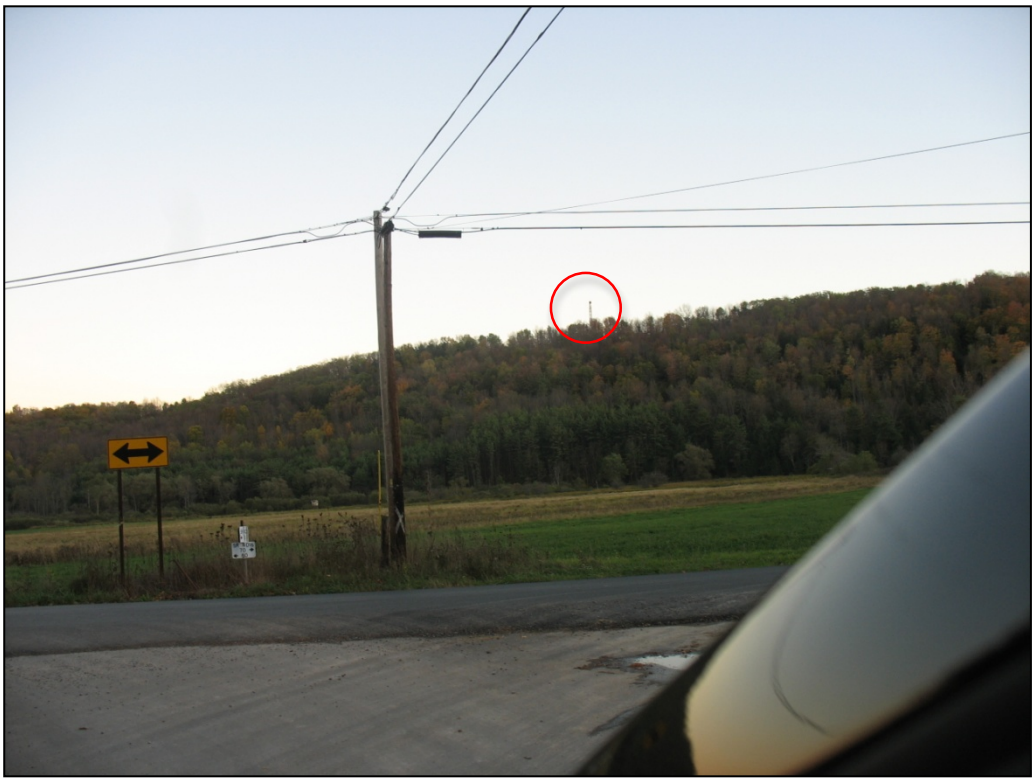
Well pads and brine pits

Well pad from scenic overview in PA

Natural Gas Pipeline

Pipeline Construction (photo Carol Chock)

Well Pad Preparation (photo Carol Chock)



Distance 1.0 miles

Distance: 1,500 feet

Distance: 1,000 feet

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