THE FRAMING OF MARCELLUS SHALE GAS DRILLING ISSUES IN
PENNSYLVANIA NEWSPAPERS

A Thesis in
Agricultural and Extension Education

by

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ABSTRACT

Thousands of articles on Marcellus Shale gas drilling and development were written in Pennsylvania newspapers from 2008-2012 (NewsBank, 2013). These stories can have an influence on how the public views the drilling because the media affect public opinion and community consensus (Bridger & Harp, 1990; Haigh, 2010; Jasperson, Shah, Watts, Faber, & Fan, 1998; McCombs, 1997). In turn, public opinion can affect public policy and other decisions made in a community (Dearing & Rogers, 1996; Jordan & Page, 1992). This study examined how newspapers in Pennsylvania portrayed issues related to Marcellus Shale gas drilling and development. The theories of agenda-setting and framing were used.

Objective newspaper articles from newspapers in Pennsylvania written between the years 2008-2012 that discuss Marcellus Shale gas drilling and development were evaluated for any differences in frames and topics from year-to-year, between regions in Pennsylvania, and between mainstream media and agriculture media. The top ten topics discussed, the most common benefits and risks, the way the Marcellus Shale industry is portrayed in newspaper articles also were analyzed. Legislation, gas companies, the environment and economics were the main focuses of the newspaper articles. Over half (53.1%) of newspaper articles depicted Marcellus Shale in a neutral way. According to Downs’ (1972) Issue-Attention Cycle, it appears that, in Pennsylvania, Marcellus Shale gas drilling and development is in the third stage, in which the public learns that significant progress will have a significant cost, or the fourth stage, in which intense public interest gradually declines. Further research should examine the public opinion on Marcellus Shale drilling and development to see if there is a connection between opinion and issues related to drilling and development presented in the media, similar to the McCombs & Shaw (1972) study in Chapel Hill, which found a correlation between information presented in the media about political issues and public opinion.
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To my graduate committee:

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Chapter 1

Introduction

In Pennsylvania, drilling for gas in the Marcellus Shale formation is a contentious issue. Both supporters and opponents of the drilling have used various media to voice their opinions, whether in writing editorials for the local newspaper, making YouTube videos, or filming documentaries such as *Gasland*, which examines the hydraulic fracturing industry in the United States (Gasland, 2012). Thousands of news articles also have been written by national, state, and local reporters on the topic of gas drilling (NewsBank, 2013). These stories can have an influence on how the public views the drilling because the media affect public opinion and community consensus (Bridger & Harp, 1990; Japerson, Shah, Watts, Faber, & Fan, 1998; McCombs, 1997). In turn, public opinion can affect public policy and other decisions made in a community (Dearing & Rogers, 1996; Jordan & Page, 1992). Examining news stories on a topic such as Marcellus Shale drilling and development, which became a polarizing issue in Pennsylvania in less than five years (Weigle, 2011), can help researchers understand information audiences have received at certain times and how consensus within a community is reached.

“Information, Please” (Background of Problem)

Despite the need to make decisions on scientific issues that shape their lives, members of the public may find it difficult to make well-educated decisions due to a lack of relevant information (Weigle, 2011). In Weigle’s (2011) study of the Marcellus Shale perceptions and subsequent actions of residents of the Pennsylvania Wilds in 12 northern Pennsylvania counties, he found residents believed “there was not enough information available to make informed,
intelligent decisions” (p. 11), and some of the information that was present was biased or tainted. Industry or environmental group information was seen as too biased and didn’t provide the whole picture of the situation with Marcellus Shale. When organizations like Penn State Cooperative Extension offered information on Marcellus Shale, participants believed the organization placed too much focus on personal profit and not enough on responsible development. According to Weigle (2011), “This lack of perceived trustworthiness in information sources allows for gossip and misinformation to emerge, a problem that continues to this day.” (p. 11).

Providing information to an audience can affect opinions on a subject. Two studies illustrate the effect of giving information about science to an audience (Batrinou, Dimitriou, Liatsos, & Pletsa, 2005; Center for Food Integrity, 2012). In the first, undergraduate students were surveyed to measure their knowledge and opinions of genetically modified foods (Batrinou et al., 2005). Students were given a question on how safe genetically modified foods were. Then, they were given a brief statement about the safety of genetically modified foods. After reading the statement, the students were asked the same question. The number of students who believed genetically modified foods are safe, probably safe, or had the same risks as conventional foods increased by 13.2%, and the number of students who believed genetically modified foods are probably risky or not safe decreased by 15.6% (Batrinou et al., 2005). Their opinions had changed because they received information that was possibly new to them on the topic of genetically modified foods.

The second study was conducted by the Center for Food Integrity (2012) to measure consumer trust in the United States food system. After initially answering a series of questions that tested their attitudes toward topics such as hormone use in beef cattle, indoor animal facilities, and genetically modified crops, survey respondents were given an informational statement about each topic. After reading the statements, respondents answered the questions again. The results suggested that consumers’ attitudes became more favorable toward the
agricultural topics discussed. In both studies, opinions on agricultural and food topics were changed after reading an informational statement related to that topic.

Statement of Problem

The agriculture topics examined in the Batrinou et al. (2005) and Center for Food Integrity (2012) studies examine issues that can have environmental and economic benefits and consequences. There are a number of other issues that could also be studied. For example, in Pennsylvania, the topic of Marcellus Shale gas drilling and development became a controversial issue (Weigle, 2011). Thousands of newspaper stories about Marcellus Shale have been printed in state newspapers over the past six years (NewsBank, 2013), with the number of articles mentioning Marcellus Shale increasing each year from 2007-2011 with a decrease in volume from 2011-2012 (see Table 1).

According to Scheufele and Lewenstein (2005), the public form attitudes and opinions on source information based on the information presented in the mass media. The media package stories, or frame them, and this influences the information the public has available. As shown in the Batrinou et al. (2005) and Center for Food Integrity (2012) studies, information does impact the public. The current study examines how the Pennsylvania media package stories about Marcellus Shale. Understanding the information the public has available to form opinions about Marcellus Shale will provide some insight into how public opinion is formed.
Table 1: Number of Marcellus Shale Articles in Pennsylvania Newspapers per Year, 2007-2012
(NewsBank, 2013)

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>3</td>
</tr>
<tr>
<td>2008</td>
<td>682</td>
</tr>
<tr>
<td>2009</td>
<td>1,687</td>
</tr>
<tr>
<td>2010</td>
<td>6,308</td>
</tr>
<tr>
<td>2011</td>
<td>7,381</td>
</tr>
<tr>
<td>2012</td>
<td>5,280</td>
</tr>
</tbody>
</table>

Why Marcellus Shale Matters to Individuals

Marcellus Shale gas drilling and development is impacting individuals in many ways. For example, private landowners may be asked to lease their land to gas companies, resulting in thousands of dollars per acre (Alter, et al., 2010; Kelsey, Metcalf, & Salcedo, 2012; Turner, 2009). The picture of housing development in a community changes when drilling comes to a county, as increased demand for housing could cause shortages in the area and leave some individuals, especially those who were already struggling economically, without a home or a regular place to live (Williamson & Kolb, 2011). For example, campgrounds have become popular in Bradford County, where zoning requires a septic system only after four recreational vehicles are parked on one piece of property (Williamson & Kolb, 2011).

State lawmakers and local officials pass legislation and zoning laws that affect individuals who live in the Marcellus Shale areas (Kelsey et al., 2012; Pennsylvania Code, 1989; Pennsylvania Code, n.d.; Pennsylvania DEP, 2011). For example, under state legislation, local governments “must allow drilling in all zoning districts, and cannot ban or restrict gas development” (Kelsey et al., 2012, p. 2). This will affect individuals because the owners of land where wells are requested will control whether or not the well will be drilled (Kelsey et al., 2012).

Another effect on the individual has been the employment and economic situation. Gas companies provide employment opportunities, with 44,000 jobs related to Marcellus Shale in
2010 (Kelsey, Shields, Ladlee, & Ward, 2011). The first wave of employees was temporary and required more temporary housing, but employees who came later had permanent jobs and were expected to be in the area long-term. For example, if the gas company set up a regional headquarters in an area, they would hire long-term employees, most likely Pennsylvania natives (Williamson & Kolb, 2011). These new workers would need permanent housing. Business owners also have noticed effects with sales increases, new customers, high employee turnover, and difficulty hiring new employees (Ward, et al., 2011).

There also have been negative environmental consequences for individuals. Incidences of water contamination have been widely reported. For example, in Dimock, residents were provided with water from the Environmental Protection Agency for several months because their own wells were contaminated (Phillips, 2012). Farmers also have been affected by fracturing water spills that contaminated pastures and drinking water (Torres, 2011; Weisman, 2012).

The Role of Newspapers in Disseminating Information

Marcellus Shale is a scientific issue that shapes lives in many ways. Individuals have their own experiences with Marcellus Shale activity. However, they may need to hear from other sources to get the whole picture. News stories provide more information to an individual so that dialogue with others in the community who are having various experiences related to Marcellus Shale gas drilling and development can take place.

The mass media contribute to community dialogue about issues and help a community reach consensus (McCombs, 1997; Shaw & Martin, 1992). As seen in stories found in NewsBank (2013), local newspapers disseminate information about the actions of companies, legislation that is happening at the state or local level, upcoming meetings about Marcellus Shale development and drilling that a community member may want to be part of, problems that occur, and the
benefits of Marcellus Shale drilling and development. Individuals are using local and regional 
newspaper websites as a key source of information (Weigle, 2011). Newspapers with articles 
about Marcellus Shale help the members of a community decide what actions they should take in 
the future.

Rationale for Study

Understanding how information is consumed is more complex than calculating how 
many hours are spent reading newspapers or consuming other types of media (Wicks, 2001), but 
examining the content of newspaper articles is one way that researchers can see what information 
is provided to the public. Newspapers help form public opinion, especially when influencing local 
citizens in their discussions and opinions of an issue (Bridger & Harp, 1990; Haigh, 2010). 
However, in the process of delivering messages to an audience, journalists reduce the information 
they have obtained so that their stories are easily understood and fit into the newspaper’s allotted 
space. Readers then use the information given in the stories to think about their own opinions and 
discuss a topic with others (Cohen, 1963; Haigh, 2010; McCombs, 1997). However, news stories 
from different media outlets may provide varying views of events (Crawley, 2007). This can 
affect public opinion. For example, if the only information about Marcellus Shale drilling that is 
given to the audience is, “Drilling wreaks environmental havoc,” the members of that audience 
will most likely sway to that opinion (Jasperson et al, 1998). However, if readers are provided 
information on more than one aspect of drilling for shale gas, they will have a broader base of 
knowledge that can be used to make well-informed choices. As Neff et al. (2008) stated in their 
research about climate change issues, the type of information given to the public needs to be 
understood before effective communication can take place. Researching how information on
Marcellus Shale gas drilling and development is presented in Pennsylvania newspapers can demonstrate how the media may affect the opinions of citizens in the Commonwealth.

Thousands of stories have been written about Marcellus Shale in Pennsylvania (Newsbank, 2013). In Colorado and Texas, the amount of coverage also has increased as a result of drilling there (Davis & Hoffer, 2012). For example, coverage in The Philadelphia Inquirer, the Denver Post, and the Houston Chronicle, newspapers in states where hydraulic fracturing operations are prominent, increased greatly from 2009 to 2011 (Davis & Hoffer, 2012). The topics covered in the stories include the roles of regulatory agencies, local impacts of drilling, and local opposition to drilling.

Media attention to hydraulic fracturing operations resulted because of the relationship of shale gas drilling to issues such as employment and public concern about environmental problems (Davis & Hoffer, 2012). While the Davis and Hoffer (2012) study includes Pennsylvania, it examines only stories from The Philadelphia Inquirer, which is based in the southeastern part of the state, which has no Marcellus Shale gas drilling. An analysis of newspaper articles over the span of several years from across the state has yet to be conducted. With the controversy over Marcellus Shale gas drilling and development issues (Weigle, 2011), studying the way that newspapers package stories about Marcellus Shale is timely and will provide some insight into how public opinion is formed.

**Operational Definitions**

**Marcellus Shale**: a geological formation found 3,000-9,000 feet below the Earth’s surface, stretching from upstate New York to Kentucky; area also includes Pennsylvania, Ohio, and West Virginia. Rich in fossil fuels, the Marcellus Shale is a source of natural gas (MSETC, 1995).
**Marcellus Shale gas drilling and development:** the process of retrieving gas from Marcellus Shale formations and aspects that are related to drilling, such as workforce and employment, housing, impacts on the landscape, gas company actions, legislation, and others. (T. Kelsey, personal communication, April 2013)

**Hydraulic fracturing (also known as fracing or fracking):** method used to recover oil and natural gas. Water carrying sand or granular material is pumped underground, and the sand is used to hold open cracks in the shale rock. These fractures allow gas to escape and travel up pipes to the surface to be used as an energy source (Harper, 2008). This technique has been used since the 1960s.

**Mainstream newspapers:** newspapers that are not related to agriculture.

**Agriculture newspapers:** newspapers that mainly cover agriculture issues.

**Shale Play:** a term used by those involved in the shale industry and the media to identify the region in which shale can be found (C. Fink, personal communication, March 1, 2013).

**Public:** “the people constituting a community, state, or nation” (Random House Reference, 2001, p. 997).

**Frame:** A technique used to simplify information in a news article. Can be presented in many different forms (Entman, 2007; Haigh, 2010; Haigh, Bruce, & Craig, 2008; Lewison, 2007; Neff et al., 2008; Nisbet & Huge, 2006; Scheufele & Tewksbury, 2007; Sheafer, 2007; Weaver, 2007).
Chapter 2

Marcellus Shale

While the media has recently picked up the stories about drilling in the Marcellus formation, natural gas has been used for more than 200 years, and Marcellus shale has been a known energy source for more than 75 years (Harper, 2008). New technology along with price incentives recently made shale drilling economical, which is one reason why the stories have been in the news.

Marcellus Shale Background

The first gas well in North America was dug in 1821 by William Hart in Fredonia, New York (Harper & Kostelnik, n.d.a.). Dug into Devonian shale, the well was 27 feet deep with a pipeline made from hollowed-out logs held together by tar and rags. By 1825, it provided natural gas for lights in four store buildings and a grist mill, and by 1850, the well was 70 feet deep and could power 200 burners (Harper, 2008; Harper & Kostelnik, n.d.a.).

Over the next several decades, many similar shale gas wells were dug from Buffalo, New York, to Sandusky, Ohio (Harper & Kostelnik, n.d.a.). The typical well was less than 1,000 feet, with some wells producing gas from 25 or 30 feet (Harper, 2008). North America’s first gas company, Fredonia Gas Light Company, was founded in 1858 (Harper & Kostelnik, n.d.a.). However, until the 1930s, most commercial oil and gas companies in Pennsylvania focused on drilling into limestone and sandstone. In 1930, drillers found a great flow of natural gas coming from the Lower Devonian Oriskany Sandstone in Steuben County, New York. This discovery led to drilling in Tioga County, Pennsylvania. Because the sandstone is beneath Marcellus Shale,
drillers found a lot of natural gas coming from the shale, so much so that the sandstone drilling was shut down by the flow of gas (Harper, 2008; Harper & Kostelnik, n.d.a.). The supply from the Marcellus Shale ran out quickly, so the drillers ignored it and continued to the sandstone instead. Even though they ignored the shale gas, “everyone knew there was gas in the Marcellus, but the consensus was that there was not enough to make a well” (Harper, 2008, p. 3).

From the late 1970s to the early 1990s, the Eastern Gas Shales Project mapped out Devonian organic-rich shales and developed drilling strategies to raise the chance of good production from the shale (Harper, 2008; Harper & Kostelnik, n.d.a.). The multidisciplinary project found the Devonian organic-rich shales had great potential and could be important energy sources in northwestern Pennsylvania with better fracturing technology. (See Figure 1 for the extent of the Marcellus Shale formation found under Pennsylvania.) Also, the project

Figure 1. Extent of Marcellus Shale Formation in Pennsylvania. (Pennsylvania Department of Environmental Protection, 2013a)
concluded that, at the time, drilling in the Marcellus Shale formation was not as attractive as drilling in the Devonian shales. Higher energy prices and advanced technology would be needed to make the process competitive. In the 1990s, new technology for extracting gas from shale was developed in Texas while drilling in the Barnett Shale there (Harper & Kostelnik, n.d.a.).

Pennsylvania’s current boom in Marcellus Shale gas drilling was spurred in 2003 when Range Resources tried drilling to the Lower Silurian formation, which is deeper than Marcellus Shale, in Washington County. The deep formations, such as Oriskany sandstone, proved unfavorable. The drilling company then began experimenting with some of the same techniques that drillers in Texas used to extract gas from the Barnett Shale formation (Harper & Kostelnik, n.d.b.). In 2005, the company began producing from Marcellus Shale wells, and since then, it has received permits for over 150 wells in Washington County. Lease prices increased dramatically as companies scrambled to invest in land in the Appalachians, land which had previously been ignored as a source of income. The greatest drilling activity has been in southwestern and northeastern Pennsylvania (Harper & Kostelnik, n.d.b.). As Harper (2008) stated, “All of this activity has been exciting the press, landowners, and state and municipal authorities, who look upon the Marcellus as a major economic boon for Pennsylvania” (p. 5). Figure 2 illustrates how many wells were drilled in Pennsylvania each year from 2007-2011, a total of 6,219 wells (Pennsylvania Department of Environmental Protection, 2013b).

Unconventional Drilling

The Marcellus Shale play stretches underneath 90,000 miles of Pennsylvania, New York, and West Virginia at depths up to 9,000 feet (Public Media for Public Understanding, 2011) and is known as an unconventional play. While conventional rocks have fluids within pore spaces, which means the fluids travel easily through the pore spaces to pipes used in drilling,
unconventional rocks such as the Marcellus shale have limited or no pore space, restricting gas movement (Harper & Kostelnik, n.d.b.). The only way for gas to travel to the pipes is through fractures created by drillers, with more fractures and greater permeability lending to better gas production.

Methods used in Marcellus Shale gas drilling are known as unconventional (Pennsylvania Department of Environmental Protection, 2013b). Hydraulic fracturing gives the gas extra space to flow to the well (Harper & Kostelnik, n.d.b.; National Park Service, 2009). During fracturing, water carrying sand or granular material is pumped underground at high pressure to split the rock. The sand is used to hold open cracks in the shale rock once the high pressure subsides. These fractures allow gas to escape and travel up pipes to the surface to be used as an energy source (Harper, 2008; National Park Service, 2009). Wells may be planned so that pipes intersect with natural fractures (National Park Service, 2009).
Horizontal drilling is also used, which reduces the number of well pads on the surface (Erik, 2013). For example, instead of using 32 pad sites for 32 wells as is done in vertical drilling, one pad site for an equivalent production of 32 wells can be used in horizontal drilling. Vertical drilling may expose hundreds of feet of the Marcellus Shale, but when the well is drilled horizontally, over a mile of the shale can be exposed to the well (National Park Service, 2009). (See Figure 3 for an illustration of the drilling cross-section.)

**County Level**

Some counties within Pennsylvania have experienced heavier Marcellus Shale drilling activity than others (see Table 2). Washington County was the first to experience drilling in the Marcellus Shale. Range Resources completed a Marcellus Shale well there in 2004, began

**Figure 3. Cross-section of typical horizontal Marcellus well (Marcellus Center for Outreach and Research, 2010).**
producing gas in 2005, and has permits for over 150 Marcellus wells in Washington County alone (Harper & Kostelnik, n.d.b.). Some of the next wells were drilled in Susquehanna County, which saw the first well drilled in 2006 (Kelsey, Shields, Ladlee, & Ward, 2012b). The first wells in Bradford County, which ranks first in the number of active wells (Amico, DeBelius, Detrow, & Stiles, 2011), were drilled in 2008 (Kenarov, 2013). The county has seen a 61% increase of sales tax revenues, a 6% unemployment rate, which is lower than the national average, and $160 million in leases. Tioga County, which ranks second in the number of active wells (Amico et al., 2011), also first saw drilling in 2008 (Thompson, 2011). Not every county immediately experienced drilling for Marcellus Shale gas. For example, the first Wyoming County wells were drilled in 2009 (Kelsey, Shields, Ladlee, & Ward, 2012c), and the first Sullivan County wells were not drilled until 2010 (Kelsey, Shields, Ladlee, & Ward, 2012a). More effects from the Marcellus Shale gas drilling and development are discussed in the economic and environmental impact sections of this chapter.

<table>
<thead>
<tr>
<th>County</th>
<th>Active Wells</th>
<th>Violations</th>
<th>Rank in Active Wells</th>
<th>Rank in Violations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bradford</td>
<td>1,795</td>
<td>614</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Tioga</td>
<td>1,197</td>
<td>415</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Washington</td>
<td>896</td>
<td>114</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Susquehanna</td>
<td>858</td>
<td>567</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Lycoming</td>
<td>846</td>
<td>474</td>
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<td>3</td>
</tr>
<tr>
<td>Greene</td>
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<td>55</td>
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<td>10</td>
</tr>
<tr>
<td>Westmoreland</td>
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<td>7</td>
<td>Not in top 10</td>
</tr>
<tr>
<td>Fayette</td>
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<td>Not in top 10</td>
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<tr>
<td>Clearfield</td>
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<td>Butler</td>
<td>268</td>
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<td>Not in top 10</td>
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<tr>
<td>Wyoming</td>
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<td>Not in top 10</td>
<td>7</td>
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<tr>
<td>Clinton</td>
<td>129</td>
<td>72</td>
<td>Not in top 10</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 2. Number of wells and violations for selected Pennsylvania counties (Amico, DeBelius, Detrow, & Stiles, 2011)
A Timeline of Recent Events

In 2008, the Pennsylvania Department of Environmental Protection (DEP) (2011) required a mandatory water plan for every Marcellus Shale drilling permit. The agency also placed a list of chemicals used in hydraulic fracturing on its website and raised the well drilling application fee from $100 to $5,000 or more.

In 2009, one of the most well-known well contaminations occurred. On January 1, Dimock resident Norma Fiorentino’s water well exploded after stray methane leaked into the well and ignited (StateImpact, n.d.a.). The methane migration was traced to Cabot Oil and Gas Corporation’s defective wells with problems in the well casings and cement (Governor’s Marcellus Shale Advisory Commission, 2011). Fourteen water supplies became unusable, and fifteen families sued Cabot (Governor’s Marcellus Shale Advisory Commission, 2011; StateImpact, n.d.a.). Also that year, the Pennsylvania DEP hired additional staff for oil and gas and opened new offices in drilling areas (Pennsylvania DEP, 2011).

In 2010, on June 3, a well owned by EOG Resources Inc. on the Punxsutawney Hunting Club’s property blew out. Natural gas and fracturing fluids flowed out onto the ground and into the air for 16 hours. (Governor’s Marcellus Shale Advisory Commission, 2011). In August, the Pennsylvania DEP passed regulations that required companies to adhere to total dissolved solids (TDS) standards for safe drinking water (Pennsylvania DEP, 2011). In October, during Operation FracNET inspections, in which the Pennsylvania State Police and the Pennsylvania DEP carry out inspections of trucks that haul wastewater from Marcellus Shale drilling operations (Lewis & Gresh, 2010), 1,175 trucks were inspected with 1,057 traffic citations given, 52 drivers removed, and 207 trucks “placed out of service because of safety concerns” (Lewis & Gresh, 2010, para. 3). In November, a rule requiring a 150-foot buffer between streams and wells took effect (Pennsylvania DEP, 2011).
In 2011, 432.5 billion cubic feet of natural gas were produced between January and June (Penn State Public Broadcasting, 2011). In February, updates to Pa. Code Title 25 (Environmental Protection), Chapter 78 (Oil and Gas Wells) were finalized (Pennsylvania Code, 1989; Pennsylvania Code, n.d.; Pennsylvania DEP, 2011). The updates related to the construction and monitoring of oil and gas wells and water protection. In February, an explosion and fire from a natural gas storage tank at a Chesapeake Appalachia LLC Powers well site in Avella, Washington County, injures three (Falcheck, 2011; WPXI, 2011).

On April 20, a Chesapeake Energy well in Leroy Township, Bradford County, blew out, resulting in the spill of 10,000 gallons of water mixed with chemicals used in the fracturing process (Governor’s Marcellus Shale Advisory Commission, 2011; Rubinkam, 2011), which contaminated a nearby stream and led to the evacuation of seven families near the spill (Rubinkam, 2011). A nearby pasture also was affected (Falcheck, 2011) and “officials advised a neighboring farmer to prevent his cows from drinking surface water” (Rubinkam, 2011, para. 7). Over 16 hours after the equipment failed, fluid was still flowing (Hamill, 2012). Chesapeake blamed an equipment vendor for the accident (Falcheck, 2011; Rubinkam, 2011).

The Pennsylvania DEP later fined Chesapeake $1.1 million for the Bradford County incident, as well as $188,000 for the February tank fire in Washington County (Falcheck, 2011).

In 2012, problems in Dimock, Pennsylvania, began again. In January, the Environmental Protection Agency (EPA) began delivering fresh water to four households in Dimock because of concerns about water test results (Phillips, 2012). The EPA tested 64 homes between January and June 2012, and stopped water deliveries in July after determining that treatment systems could reduce toxin amounts in water supplies. From January to June, 895 billion cubic feet of Marcellus Shale gas were produced, up from 432.5 billion cubic feet during the same period in 2011 (Penn State Public Broadcasting, 2011).
Major legislation known as Act 13 was passed on February 8, 2012. The Act stated that local governments are not allowed to block gas development (Kelsey et al., 2012). The Act also required fees for wells drilled, with fees to be paid by September 1 of each year (StateImpact, n.d.b.). The fees would change annually based on the price of natural gas and the Consumer Price Index. Initially, revenue was estimated to be $180 million, with 60% of the revenue going to local government and the rest to state agencies. However, in July, Pennsylvania’s Commonwealth Court determined portions of Act 13 to be unconstitutional, stating that limits on local zoning “unconstitutionally bar local governments from their right to separate industrial activity from residential neighborhoods” (Detrow, 2012a, para. 2). However, the rest of the legislation remained effective. In September, the Pennsylvania Public Utility Commission announces that revenue from Act 13 is $206 million, higher than the expected revenue of $180 million (Marcellus Shale Coalition, 2012).

The Economic Impact of Marcellus Shale

Lease fees, taxes, royalties, and other economic areas related to Marcellus Shale are affecting the economy of communities across Pennsylvania (Adams & Kelsey, 2012; Harper, 2008; Kelsey et al., 2011). Several business sectors have changed as a result of drilling and development. In 2010, 44,000 Pennsylvania jobs were related to Marcellus Shale activity (Kelsey et al., 2011). Business owners in Bradford and Washington Counties, where drilling is prominent, have reported positive growth with an increase of sales and new customers (Ward, et al., 2011). However, businesses also had a higher rate of employee turnover and a harder time finding employees. Areas such as hotels and campgrounds, construction, restaurants, transportation, and wholesale trade and financial services businesses experienced the highest sales increases and greatest changes in their businesses (Kelsey et al., 2011; Ward, et al., 2011, p. 2). The survey
showed that positive impacts such as increased sales and new customers were occurring, but that negative impacts such as finding new employees and turnover were also occurring. However, tourism destinations were not suffering the negative effects, as of 2011.

More changes have occurred with taxes collected in each county (Costanzo & Kelsey, 2012). Data from the Pennsylvania Department of Revenue indicated that state tax collections and Marcellus Shale drilling activity were related (Costanzo & Kelsey, 2012). Counties with higher activity levels experienced “larger percentage increases in sales, personal income, and smaller declines in realty transfer tax collections” (Costanzo & Kelsey, 2012, p. 6) than counties with less Marcellus Shale activity. Costanzo and Kelsey (2012) noted sales tax increases showed that “Marcellus development positively affects the local retail sector” (p. 6). Counties with the largest increases in sales tax collections were Bradford at 50.8%, Greene at 31.4%, and Susquehanna at 27.4%. Other counties with a large amount of drilling also saw increases in state tax collections, such as Washington County with an increase of 10.3% and Tioga County with an increase of 13.8% (Costanzo & Kelsey, 2012).

The effects of Marcellus Shale on housing have been numerous (Williamson & Kolb, 2011). Through interviews with over 70 stakeholders such as elected officials, landlords, realtors, gas company representatives and new residents, among others, in Bradford, Greene, Lycoming, Sullivan, Washington, and Westmoreland Counties, Williamson and Kolb (2011) learned about four prominent issues: “rental housing, owner-occupied housing, housing affordability and availability, and the capacity of the development community to meet demand for housing” (p. 1). The extent of the housing problem in each county depended on how much the natural gas industry had grown there and the county’s ability to handle increased housing demand. For example, rural counties with high Marcellus activity, such as southern Washington County, have encountered difficulty in meeting the demand for more housing (Williamson & Kolb, 2011). Also, counties with permanent operations such as regional headquarters for gas and service companies
experience “more and longer term housing impacts than communities where there is only drilling
and pipeline activity” (Williamson & Kolb, 2011, p. 1). In areas such as Sullivan County with
drilling and pipeline activity only, workers need temporary housing. However, with permanent
operations in counties such as Lycoming and Bradford, staff often need permanent housing
because they will work in the area for a long period of time. According to Williamson and Kolb
(2011), the housing demand in these communities will remain steady in the near future.

If a county had experience with population growth through working with other industries
or from people who commute to nearby cities, it had “existing development capacity”
(Williamson & Kolb, 2011, p. 1) because local builders are experienced in working with
regulations and officials to respond to housing needs. Williamson and Kolb (2011) also found
that while the effects of a higher demand for housing are felt by many, the hardest-hit are “those
living at the economic margins” (p. 1), prominently the poor (both employed and not working),
seniors, and the disabled. While these groups originally did not have extensive options for
housing, they are limited even more in communities affected by the drilling and often must live in
substandard housing. Some may have no home at all.

Another factor affecting the impact of the Marcellus Shale gas industry on housing is the
diversity of housing needs in different time frames. There were two waves of employees in the
gas industry: the first employees required only temporary housing, and their needs were met with
hotels, temporary facilities called man camps, campgrounds, and rental housing that already
existed in the community (Williamson & Kolb, 2011). The second wave of employees required
more permanent housing, such as renting or owning a house, because the employees could expect
to live in the area for a lengthy amount of time and could afford better living arrangements
(Williamson & Kolb, 2011). Pennsylvania natives are included in this second group. However,
permanent employees expect higher quality housing than what is actually available. Williamson
& Kolb (2011) noted, “Most residents moving into the region are looking to buy new homes in
move-in condition with all the modern conveniences. Instead, they find an aged housing stock in poor condition and lacking modern touches” (p. 2).

The final finding in the stakeholder interviews was that counties differ in their abilities to meet increased housing demands. If a county did not have much development before Marcellus Shale drilling began, Williamson and Kolb (2011) found, then they have a hard time attracting new development due to “the lack of local developers, a tight financing market, inadequate utility-served land available for development, regulatory hurdles, and lingering doubts about the Marcellus Shale gas industry” (p. 2). Also, previous history of population growth or decline determines how well a county can meet housing demands. Counties such as Bradford, Greene, and Sullivan had a small, stable population with not much experience with providing new housing. Other counties such as Lycoming experienced declines or stability, but they kept enough of an economic base to sustain “a modest level of development activity” (Williamson & Kolb, 2011, p. 4-5). In other areas like northern Washington County and Westmoreland County, suburban development was common, so the rush of housing demands related to Marcellus Shale drilling could be met more easily. Rural areas such as southern Washington County have experienced the most difficulty with housing and attracting new development.

Within the agriculture sector, counties with a high number of Marcellus Shale wells experienced a decrease in dairy cow numbers between 2007 and 2010 (see Table 3) (Adams & Kelsey, 2012). Some anecdotal evidence suggests that farmers are shifting from a focus on dairy production to crop production. Other evidence suggests farmers are leaving the business completely or using royalty dollars to help improve or maintain their operations. With the dairy industry accounting for around 33% of Pennsylvania’s total farm receipts, these shifts will have an impact on the agricultural economy, not only within dairy, but also within supporting businesses that supply inputs and services for the farms or purchase dairy products from the farms.
Table 3: Change in Number of Cows by Marcellus Drilling Activity, 2007-2010. (Adams & Kelsey, 2012, p. 2)

<table>
<thead>
<tr>
<th>Drilling activity within the county</th>
<th>Percent change (number of counties)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Marcellus wells</td>
<td>-1.2% (28)</td>
</tr>
<tr>
<td>1-9 Marcellus wells</td>
<td>-8.9% (11)</td>
</tr>
<tr>
<td>10-149 Marcellus wells</td>
<td>-11.3% (12)</td>
</tr>
<tr>
<td>150 or more Marcellus wells</td>
<td>-18.7% (5)</td>
</tr>
<tr>
<td>State average change at county level</td>
<td>-6.4% (56*)</td>
</tr>
</tbody>
</table>

*Does not add to 67 counties due to missing data for some counties.

Nationally, there are contrasting opinions in the effect that natural gas will have on the economy. In March 2012, U.S. Secretary of Agriculture Tom Vilsack reported that the rising gas prices at the time could have been worse without biofuels, at least $0.80 to $1.30 higher (Thompson, 2012). Vilsack said, along with these biofuels, natural gas was an important component of the country’s energy sector, as the U.S. became the world’s largest exporter of natural gas in 2009. However, criticism has arisen as people say that the shale run will be short lived and has already run out of wonder and usefulness (Udall, 2013). Natural gas prices have decreased considerably, hitting lows in 2012 at below $2 per thousand cubic feet (Denning, 2012; Troeh, 2012). The low price came because of a high supply of natural gas, which was a result of hydraulic fracturing technology (Troeh, 2012).

Still more concerns arose from the financial actions of the natural gas companies and their expenses during the drilling process (Demelle, 2012; Urbina, 2011). In 2011, e-mails from experts in drilling and finances questioned gas companies’ actions in reporting high well productivity, as the shale gas was called unprofitable by some (Urbina, 2011). Critics questioned the affordability of shale gas extraction and wondered if it was in the best interest of consumers.
and landowners, who would pay higher prices for the product or see decreases from their investments.

The Leasing Process

Landowners in the Marcellus Shale play have received upwards of a million dollars for leasing their land to natural gas companies (Turner, 2009). Sometimes, so many leases are signed and so much money given out that landowners simply go to the nearest American Legion post, as they did in Black Walnut, Pennsylvania, in 2009. At the American Legion post, landowners stood in line to receive their checks from accountants who sat at tables calculating payments. Some landowners cried when they received their allotted payment because the amount of money received was so high (Turner, 2009).

During the leasing process, landowners will first be given a typical lease agreement from the gas company (Pifer, 2008). This lease will determine every aspect of the drilling and the landowner and company relationship. The lessors are the owners of the natural gas rights, which may not necessarily be the surface land owner. The lessee may be a company or an independent contractor (Pifer, 2008). Landowners also may hire an attorney to assist them in negotiating with the company (Pifer, 2008). Both parties then negotiate specific terms, considering factors such as number of acres, physical and geologic features of the property, the natural gas market and companies in the area, and other infrastructure nearby (Pifer, 2008). The landowner may grant both mineral estate and surface estate rights, or they may withhold surface estate rights (Pifer, 2008). However, withholding surface estate rights may mean a lower payment. Rights granted include oil and gas, other minerals, pipeline and storage (Greevy, 2008).

Payment terms include a bonus payment, which is a negotiable amount, paid when the lease agreement begins (Pifer, 2008). Landowners also receive delay rental payments given at
specified times during the leasing period. It is paid in dollars per acre (Greevy, 2008). Once a well is drilled, the lessee’s obligation to regularly pay the lessor ends (Pifer, 2008). When the lease ends, royalty revenues then kick in (T. Kelsey, personal communication, June 2013).

Several other payments may be made, depending on the production of the well. Royalty payments are given when “natural gas is removed from the land” (Pifer, 2008, p. 17). These payments must be a minimum of 12.5% (Greevy, 2008), but negotiations for a higher rate may occur (Pifer, 2008). Shut-in royalty payments are made when “a well is drilled, but gas is not yet marketed” (Pifer, 2008, p. 18). Once again, the landowner can negotiate amount and circumstances of payments. Also, the lease may provide for a certain amount of natural gas to be available to the landowner at no cost, as long as the landowner provides for the transportation of gas to the residence. (Pifer, 2008). The landowner may negotiate with the company for a payment instead of the free natural gas.

The Energy Impact of Marcellus Shale

The growth of natural gas production in the United States has been largely due to technology and drilling in regions with a high concentration of “natural gas liquids and crude oil, which have a higher value in energy equivalent terms than dry natural gas” (U.S. Energy Information Administration, 2012, p. 1). Natural gas meets 22% of U.S. energy needs (see Figure 4) (Groundwater Protection Council, 2009), and shale gas accounted for 23% of U.S. dry gas production in 2010 with 5.0 trillion cubic feet (U.S. Energy Information Administration, 2012). Production is expected to increase to 13.5 trillion cubic feet in 2035, which would account for 49% of U.S. dry gas production. However, there have been concerns that cheap natural gas will negatively affect other energy sources, such as slowing the growth of wind or solar power (Harris, 2012).
The Environmental Impact of Marcellus Shale Drilling

The process of hydraulic fracturing to remove gas from shale has been used for over 60 years (King, Bryan, & Clark, 2012). Because the range of Marcellus Shale is large, at 54,000 to 96,000 square miles, many wells are needed to access the gas (Smith, 2012). This range includes densely-populated areas (Smith, 2012), and many concerns about the drilling’s effect on the environment have arisen. However, opinions on its actual effects are varied. While some researchers cite several studies showing that hydraulic fracturing is safe and does not contaminate drinking water when all goes well (King et al., 2012), others note that gas wells have had a negative effect on drinking water (Environmental Working Group, 2011; Osborn, Vengosh, Warner, & Jackson, 2011). Davies (2011) stated that while contamination did occur in gas wells, pointing to hydraulic fracturing as the source is not scientifically based. On the other hand, some
Pennsylvania residents have struggled with negative effects of drilling on their lands. For example, one Fayette County family experienced leaky gas wells and ruined streams on their farm (Weisman, 2012). One family member had to rescue one of their dogs from a sludge pond, a process that damaged her hands for six months. One Bradford County farmer’s well water became contaminated in 2011 (Kenarov, 2013). As a result, the family experienced skin rashes, and one person fell ill with intestinal, liver, and spleen issues. However, her health improved when she moved away from the farm (Kenarov, 2013). Similar experiences for other families are related throughout several news outlets.

To study the health effects of hydraulic fracturing, toxicologists from the University of Pennsylvania are leading a team to examine the effects of drilling byproducts on human health, the air quality near a well, and the effect of a high use of diesel fuel for trucks used in the drilling process (Hurdle, 2013). The Environmental Protection Agency also conducts studies on the effects of hydraulic fracturing on water supplies.

Archaeologists in the state are concerned about the effect of Marcellus Shale on historical sites. Pennsylvania historical societies first saw the gas drilling as a threat in the 1980s (Swaminathan, 2011). Some archaeological sites now have gas drill rigs due to the Marcellus Shale boom, and archaeologists are concerned that the drilling could affect the historical sites and artifacts. Research is being conducted on how to balance the economic benefits with archaeological interests.
Chapter 3

Literature Review

Time and space in a media publication are limited (Entman, 2007; Shaw & Martin, 1992). Therefore, journalists must make decisions on what issues and information will be presented within a news story (Haigh et al., 2008; Price, Tewksbury, & Powers, 1997). Because consensus on an issue within a community can be affected by the media (Jasperson et al., 1998; McCombs, 1997; McCombs & Shaw, 1972), the decisions on what information to present can affect the overall opinion of a community on an issue and subsequent action on that issue (Dearing & Rogers, 1996; Jordan & Page, 1992; McCombs, 1997).

Agenda-Setting

The agenda-setting theory states mass media emphasize certain issues by increasing the issue’s attention or prominence in news stories, and in turn, the audience is influenced in what issues they consider to be important and in their overall attitude about the issues presented (Kim, Scheufele, & Shanahan, 2002; McCombs, 1997; Scheufele & Tewksbury, 2007).

Walter Lippman (1922) previewed the idea of agenda-setting, although it was not called that at the time. In Public Opinion (1922), he named the first chapter, “The world outside and the pictures in our heads” (p. 3) and told the story of an island on which English, French, and German citizens lived harmoniously in the years before World War I. News did not come often, so it was not until six weeks after the war started that they learned that war had begun and that the English and French were enemies of the Germans. Therefore, according to Lippman (1922), their reality for that six weeks of the three nationalities living harmoniously was not reflective of the true
environment because the news of the war was delayed in reaching the island’s inhabitants. Lippman (1922) stated, “Whatever we believe to be a true picture, we treat as if it were the environment itself” (p. 4).

The public tries to understand a notion, such as war, that it has never seen in a place they have never been to with people they have never met (Lippman, 1922). Often, the only way that understanding can take place is through the mass media. Perception of an event can lead to strong emotion, even if the event is never actually experienced. Lippman (1922) relays the story of a girl who saw a cracked window pane and believed strongly that her father had died, based on the superstition of a cracked window meaning that a close relative had died. That was her reality until a telegram which said her father was alive came and disproved her belief.

Audience members “are not equipped to deal with so much subtlety, so much variety, so many permutations and combinations.” (Lippman, 1922, p. 16). The audience members must reconstruct the information so that it is easier to understand. Not all information will be based on direct experience, but on pictures given to the audience from other sources. These pictures shape his view of the world, and eventually, each person’s knowledge of the world determines his effort, feelings, and hopes in life (Lippman, 1922). Because of these ideas, Lippman eventually became known as the “intellectual father of agenda-setting” (McCombs & Reynolds, 2002, p. 2).

Bernard Cohen (1963) advanced the thought that media affects an audience member’s map of the world. According to Cohen (1963), the media is “significantly more than a purveyor of information and opinion. It may not be successful much of the time in telling people what to think, but it is stunningly successful in telling its readers what to think about” (p. 13). Therefore, views of the world looked different, depending on both personal interests and the media map. Cohen (1963) also stated the media captivates an audience and determines “what they will be thinking about, and talking about, until the next wave laps their shore” (p. 13).
However, the term and idea of agenda-setting was not used until McCombs and Shaw’s research in Chapel Hill, North Carolina (Rogers, Dearing, & Bregman, 1993). The story began when McCombs was with his colleagues talking about the local paper’s headline news and wondered why one specific story was highlighted over another story. Agenda-setting research began with the McCombs and Shaw (1972) Chapel Hill study. McCombs and Shaw’s (1972) agenda-setting hypothesis stated the focus for a political campaign is determined by the mass media, which also influences the importance of an issue. Reflecting Cohen (1963), the researchers noted mass media may not greatly influence the public’s attitudes, but the media have an influence on what the public thinks about.

To test the agenda-setting hypothesis, a mixed-methods approach was taken. Content analysis was used to examine the products of mass media outlets in Chapel Hill, North Carolina, during the 1968 presidential campaign. Voters in Chapel Hill also were interviewed about what they said were key issues, and those answers were compared with the content of the mass media consumed during the campaign (McCombs & Shaw, 1972).

Results showed voters’ opinions reflected a combination of what was presented in mass media from various locations (McCombs & Shaw, 1972). Even while media had different points of view, the different media still agreed on what issues were important. McCombs and Shaw (1972) stated the correlations found in the study do not prove the theory of agenda-setting, but the study was a good beginning for agenda-setting research as the results suggested the media’s emphasis on various campaign issues and voters’ judgments on the importance of those issues were related. Because few people were directly involved in political campaigning, mass media news coverage was the most accessible source of information for the public.

Reading newspaper articles and watching the news on television contribute to the ability to participate in dialogue between different social groups, such as men and women or more educated and less educated (Shaw & Martin, 1992). This is due to the press providing a few
issues for public dialogue and the media not telling the public what to believe, but giving the audience suggestions on what issues to discuss and agree on (Cohen, 1963; Shaw & Martin, 1992). Five to seven issues usually emerge, and these issues remain at the forefront for a while as the media agenda does not change daily (Shaw & Martin, 1992). However, those involved in the media are not aware of their role in setting the public agenda (Cohen, 1963; Shaw & Martin, 1992). They believe they are simply doing their jobs and printing what the audience wants to read (Cohen, 1963). Likewise, audience members are not aware of their role in setting the public agenda.

The media can bring consensus to social groups within the community as long as the audience members consume media individually (McCombs, 1997; Shaw & Martin, 1992). To accomplish community consensus, an issue needs to be made salient and placed on the community agenda (McCombs, 1997). Groups within the community can then participate in a dialogue about the issue (McCombs, 1997; Shaw & Martin, 1992). With the media’s help, various social groups can reach across the table and discuss an issue, even though they may not agree on the solution to an issue.

There are two different ways that media may use to set the public agenda: top down and bottom-up (McCombs, 1997). In the top down approach, the leadership or elites (Druckman, 2001; Kwansah-Aidoo, 2005; McCombs, 1997) decide what topic will go on the agenda, and they expect the public to respond to the topic as it becomes a priority on agendas for the government and the public. Audiences may influence reporting as well when the news media wants to “match audience interests. To the extent there is a match, we have given the media a certain power to set the agenda” (Shaw & Martin, 1992, p. 906). In the bottom-up approach, public opinion polls are taken to understand the public’s issues and concerns, which are then reported in the news (McCombs, 1997). In turn, politicians and governments may then set their own agendas based on the news agenda. This means that the public’s concerns could be addressed because their
concerns are reported on. With both the top down and the bottom-up approaches, the goal is to achieve community consensus.

The priorities of a community can affect what issues are covered in the media (McCombs, 1997). Because groups such as the public, the press, or the government can only deal with a limited number of issues at a time, consensus about the most important issues on the agenda is needed. McCombs (1997) stated that “helping to achieve this consensus is one of mass communication’s most important contributions to building community” (p. 434-435). Within the life span of an event, the media will emphasize various attributes of the event “to keep the story alive and fresh.” (Chyi & McCombs, 2004, p. 22). However, the public can still lose interest in an issue because of its “limited attention span” (McCombs, 1997, p. 434). Newspaper coverage on certain issues varies based on this attention span, which Downs (1972) named the issue-attention cycle. According to Downs (1972), “American public attention rarely remains sharply focused upon any one domestic issue for very long—even if it involves a continuing problem of crucial importance to society” (p. 38). Downs (1972) identified five phases:

1. The pre-problem stage: In this stage, a problematic condition, such as poverty or malnutrition, exists and alarms experts, but the public has not yet paid much attention to the issue.

2. Alarmed discovery and euphoric enthusiasm: Through variables such as dramatic events, the public becomes aware and alarmed about the problematic condition. The public then becomes zealous about the issue and wishes to do something about it.

3. Realizing the cost of significant progress: Gradually, the public realizes that great funds and major sacrifices would need to be made in order to solve the problem.

4. Gradual decline of intense public interest: The third stage subtly becomes the fourth stage of declining interest in the problem. This stage occurs in reaction to the realization that it would be difficult and costly to solve the problem. Discouragement, feeling threatened by the
enormity of a proposed solution, and becoming bored by the issue are reactions that people may have during this stage. Concurrently, another issue is diverting the public’s attention.

5. The post-problem stage: Downs (1972) calls this “a twilight realm of lesser attention or spasmodic recurrences of interest” (p. 40). It is similar to the pre-problem stage in that the issue does not have much attention in the public eye. However, during the stages when the issue was in the public eye, new organizations or legislation may have been created to address the issue. These actions persist and influence future steps related to the issue even though it may no more be widely addressed by the public or media (Downs, 1972).

Not all issues will go through the cycle, and at any time, only a few issues can be brought to the public’s attention (Downs, 1972; McCombs, 1997). These issues have certain characteristics: a numerical minority suffering from the problem more than a majority (e.g. poverty, crime, and unemployment); the “majority or powerful minority” (Downs, 1972, p. 41) benefitting from an arrangement that causes suffering to others; or the exciting qualities of a problem – or lack of exciting qualities. Public interest declines when the amount of reporting on the issue decreases.

Decreasing intensity of reports in the news could be attributed to journalism’s short attention span (McCombs, 1997). New information and new angles are needed in order for an issue to continue to be included in the news agenda, even if the topic is important. Furthermore, when the Gallup Poll conducts a survey to examine what Americans say is the “most important problem facing the country today,” at least 10 percent of those polled typically name four or fewer issues (McCombs, 1997, p. 435). Sometimes, only one issue is at the top of the public agenda during a certain period of time.

However, the media is not the only agenda-setter in the community, as many different interest groups, people, and institutions are invested in a community and may be interested in what is going on around them (Shaw & Martin, 1992). Public agendas are powerful in the
public’s eye, and there are many agendas, and thus, many agenda-setters. Interest groups, legislators, and others can influence the volume of and shape media messages on an issue (Scheufele & Tewksbury, 2007). The media are only a small part of the “competing social whole” (Shaw & Martin, 1992, p. 908).

Agenda-setting theory focuses on the “achievement of consensus among the members of a public” and gives great credit to the media for gaining community consensus on current issues (McCombs, 1997, p. 433). By gaining consensus, the news media set the public agenda, identifying what problems are “worthy of public and government attention” (Entman, 2007, p. 164) and therefore influence and perhaps even increase the salience of an issue (McCombs, 1997; Scheufele & Tewksbury, 2007). Shaw and Martin (1992) defined agenda-setting as “a matching of issue patterns by collections of people in a social system, people who learn, talk, vote, act, and sometimes speak back to the media” (p. 906).

Agenda-setting research focuses on salience (Chyi & McCombs, 2004; Dearing & Rogers, 1996), which is “the relative importance of an object—a public issue, public figure, or any other topic—in the media or among the public” (Chyi & McCombs, 2004, p. 22). Salience is increased when the volume of reporting on that issue increases (Chyi & McCombs, 2004; Dearing & Rogers, 1996; Kim, Han, Choi, & Kim, 2012). Measuring the amount of reporting and attention an issue receives is the easiest way to measure salience (Kiousis, 2004). Prominence within the newspaper also can be considered. The placement of a story could determine the importance of the issues within the story to the audience.

Salience is not only about the importance of an issue. When mass media increase the salience of certain issues through agenda setting, the media also can influence what attributes of those issues are highlighted, what considerations are given to the issue, and what conclusions are reached when the public makes a decision about an issue (Kim et al., 2012; Scheufele &
Tewksbury, 2007; Sheafer, 2007). Salience also guides the formation of the public agenda, which then affects what issues legislators and other policymakers consider (Dearing & Rogers, 1996).

**Framing**

Agenda setting has two levels: the first focuses on the relative importance (salience) of issues or topics (Weaver, 2007) and deals with the amount of time and attention a subject receives (Scheufele & Tewksbury, 2007), and the second focuses on the importance of attributes of issues (Kim, Scheufele, & Shanahan, 2002; Weaver, 2007) and the descriptions and labels used in a news story about an issue (Scheufele & Tewksbury, 2007). In other words, first-level agenda setting examines “whether we think about an issue” while second-level agenda setting looks at “how we think about an issue” (Scheufele & Tewksbury, 2007, p. 14).

Second-level agenda setting also is known as framing. Framing influences how an audience views an issue as certain elements or facts are used to put together a story that promotes a certain interpretation, evaluation, or solution (Entman, 2007; Iyengar, 1991; Kim et al., 2002). The frames reduce an issue’s complexities and serve as “interpretive shortcuts” (Kim et al., 2002, p. 8) for the audience.

Entman (2007) defined framing as “the process of culling a few elements of perceived reality and assembling a narrative that highlights connections among them to promote a particular interpretation” (p. 164). Two different people who read about the same issue will interpret the situation differently if different descriptions about the issue are offered (Kim et al., 2002). Some issues are too complicated to address every facet of it in a news article, so frames (the descriptions or labels) are used to simplify complex issues for the audience (Kim et al., 2002; Scheufele & Tewksbury, 2007). The audience also uses frames in their evaluation of an issue (Scheufele & Tewksbury, 2007).
Unlike first-level agenda setting, in which exposure to a message might be enough, framing focuses on the message that is presented (Scheufele & Tewksbury, 2007). While agenda setting theory says the amount of time and attention that an issue receives has an effect on an audience, the framing approach assumes the description or labels used in the news have an effect (Kim, Scheufele, & Shanahan, 2002; Scheufele & Tewksbury, 2007) and determine how an audience thinks about an issue (Scheufele & Tewksbury, 2007). The frames are used to draw attention to newsworthy objects, as well as certain attributes of those objects (Weaver, 2007, p. 142). Audiences combine pieces of various frames to understand events, and this understanding influences their support for actions. For example, audiences used several pieces of media frames to construct their understanding of the events of September 11, 2001, and in turn, this affected their support of the war in Afghanistan (Scheufele & Tewksbury, 2007).

The term framing became dominant in communication research articles in the 1990s and early 2000s, as the number of articles on framing increased and the number of articles on agenda-setting decreased (Weaver, 2007). The reason for the shift was not clear, but Weaver (2007) speculated that the “ambiguity or the comprehensive nature of the term” (p. 144) contributed to its rise in popularity.

The framing approach originated from psychological and sociological pursuits and the need to cope with information overload (Scheufele & Tewksbury, 2007; Entman, 2007). Researchers in psychology examined how presentation of an issue or event affected people’s evaluations of the choices they were given (Scheufele & Tewksbury, 2007). Researchers in sociology examined the concept that “individuals cannot understand the world fully and constantly struggle to interpret their life experiences and to make sense of the world around them” (Scheufele & Tewksbury, 2007, p. 11). Part of the struggle of interpretation is information overload, and individuals and organizations need ways to cope (Entman, 2007). When individuals have limited time, attention, and rationality, “getting people to think (and behave) in a certain
way requires selecting some things to tell them about and efficiently cueing them on how these elements mesh with their own schema systems” (Entman, 2007, p. 164-165).

News content is organized into a story line or idea that gives meaning and context to an event or issue and influences how the audience interprets or understands the event or issue (Entman, 2007; Haigh et al., 2008; Scheufele & Tewksbury, 2007; Sheafer, 2007; Weaver, 2007). The frame also shows the heart of the issue and is identified by examining the emphasis of a news narrative, including “key words, metaphors, concepts, symbols, and visual images” (Haigh et al., 2008, p. 51). In forming frames, journalists make choices as to what to present in the news (Haigh et al., 2008). These choices are often determined by culture (Scheufele & Tewksbury, 2007) and focus on “certain aspects of reality” (Haigh et al., 2008, p. 51).

Frames can be found in all media messages, including messages about science (Haigh, 2010; Lewison, 2007; Neff et al., 2008; Nisbet & Huge, 2006; Nucci & Kubey, 2007). There are several types of frames that can be used to study media coverage.

Scientific background frames give the scientific, technical, or medical history of an issue (Haigh, 2010; Nisbet & Huge, 2006). This frame could be used to describe past research results or describe future scientific applications for agriculture or medicine (Nisbet & Huge, 2006). The political strategy frame also was used can examine the political debate surrounding an issue by looking at the discussion about the strategies, actions, or deliberations of political entities and individuals, such as lobbying groups (Haigh, 2010; Nisbet & Huge, 2006). The frame focuses “on who is ahead or who is behind in the political conflict and their tactics for gaining an advantage” (Nisbet & Huge, 2006, p. 20). The public engagement and public opinion frames can be used to determine how aware the public is about a certain issue and what their opinions are on that issue (Haigh, 2010, Nisbet & Huge, 2006). This frame focuses on polls, reaction from a local community leader or someone who is not an expert in the field, and emphasizes personal stories from farmers, consumers, or activists (Nisbet & Huge, 2006).
Environmental concerns is part of the scientific uncertainty frame, which explores risks to people or the environment, challenges scientific trials or claims, or emphasizes uncertainty in areas such as the safety of the food supply (Haigh, 2012; Nisbet & Huge, 2006). The domestic economy frame (Haigh, 2010; Haigh et al., 2008) is used for discussion of the economic impact on certain geographic areas and the people who live and work there. For this study, with the infrastructure concerns frame was used for concerns about human developments such as bridges and roads.

Tone of articles and discussion on benefits and risks are often included in studies about science communication. Thomson and Dininni (2005) found the tone of coverage on genetically modified organisms reflected the topic of coverage. They also found risks and benefits of agricultural biotechnology were discussed in articles, but one was not emphasized over the other. When there is no emphasis on risks or benefits, Thomson and Dininni (2005) argued, the public has “little information with which to understand what, for many, is a critical question: Is agricultural biotechnology beneficial or not to the environment, our quality of life, and our economic welfare?” (p. 250).

**Research Questions**

The frames used in a news story can affect public consensus within a community (Jasperson et al., 1998; McCombs, 1997; McCombs & Shaw, 1972), as well as actions such as public policies that could arise from public opinion (Dearing & Rogers, 1996; Jordan & Page, 1992; McCombs, 1997). Knowing what issues are discussed in the media, as well as differences between regions and types of media, can give a picture of what information is available to the public for making decisions.
The Haigh et al. (2008) and Haigh (2010) studies found differences for location of the paper and how science issues were framed. While Haigh et al. (2008) and Haigh (2010) examined national coverage, the same idea that location influences coverage can be applied to Pennsylvania newspapers covering the Marcellus Shale industry.

Also, examining how frames and topics related to Marcellus Shale have changed over time can give a picture of what information has been available throughout the five years of coverage. Downs’ (1972) issue-attention cycle illustrates how the focus of news stories can change throughout the cycle’s five stages. Marcellus Shale gas drilling and development has changed greatly in the last five years. This study examines the topics covered and if these changed over time.

The following research questions are designed to analyze several different areas of newspaper articles about Marcellus Shale gas drilling and development:

1. What are the ten topics most often discussed in news articles about Marcellus Shale?
2. What was the most common benefit or risk described in news articles about Marcellus Shale?
3. How is the Marcellus Shale industry depicted in news articles? (i.e. negatively, positively, neutrally)
4. Do mainstream and agriculture media differ in the frames used for news articles about Marcellus Shale?
5. Do media in the shale area differ in the frames used from media outside of the shale area?
6. Do the frames used differ by year of story?
7. Do the top topics covered differ by year?
8. Do the top topics covered differ by region?
9. Do the top topics covered by mainstream media differ from those covered by agriculture media?
Chapter 4
Methodology

Frames in media stories, such as television broadcast transcripts or newspaper articles, are examined with content analysis (Chyi & McCombs, 2004; Haigh, 2010; Haigh et al., 2008; Lewison, 2007; Neff et al., 2008; Nucci & Kubey, 2007; Thomson & Dininni, 2005). A framing research approach examines the way many different aspects and types of messages are constructed and can be seen through content analysis or textual analysis (Scheufele & Tewksbury, 2007; Weaver, 2007). This study used content analysis of news articles about Marcellus Shale from 15 newspapers around Pennsylvania.

Sampling Procedures and Techniques

The unit of analysis for the study was a newspaper article ($N = 783$). The articles were pulled from selected newspapers around Pennsylvania from the years 2008 to 2012 and discuss aspects of Marcellus Shale gas drilling and development. These articles were accessed through the Newsbank Access World News database, which provides thousands of articles from media outlets worldwide and enables the researcher to limit the search to Pennsylvania newspapers. Newspapers that were not accessible via the database were accessed via their websites. Figure 5 gives a visual representation of newspaper locations. Unless otherwise noted, the papers were accessed through the NewsBank database.
The newspapers were chosen based on their locations and availability online. The papers are spread throughout the state of Pennsylvania. One agriculture newspaper, *Farm and Dairy*, is located in Ohio but covers Pennsylvania agriculture issues. The study also included media leaders such as the *Harrisburg Patriot-News*, which is known as the agenda-setting paper for the state because legislators read it (M. Haigh, personal communication, Oct. 22, 2012). The papers needed to be available and up-to-date online through NewsBank, or, in the case of two agriculture newspapers, via their websites.

Dates were sampled randomly beginning January 13-24, 2008. The beginning date was chosen around January 17, 2008, the release date of a news story from Penn State University that announced the estimate of trillions of cubic feet of natural gas available for horizontal drilling in the Marcellus Shale (Messer & Fong, 2008).
The remaining sample dates were chosen using a stratified constructed month sample. The first week was determined by the date of the first Sunday of the month, and so on. Once the fourth week of the fourth month was used, the cycle started over so that the first week of the fifth month would be used, second week of the sixth month, etc.

In order to examine the frames and topics discussed in objective newspaper articles, stories written by reporters for the local newspapers, for the Associated Press or for United Press International were used for this study. Opinion-editorials, letters to the editor, briefs, descriptions of pictures, announcements of upcoming meetings, and stories that did not focus on Marcellus Shale (such as stories on candidates for local and state elections who briefly mentioned Marcellus Shale in a quote or stories about Utica Shale that built on Marcellus Shale information) were not used. Story duplicates also were removed from the sample. The initial search yielded around 2,500 articles, which were then sorted and finalized to 816 articles for the study’s sample. In the process of coding, some articles were tossed out or not coded to yield a final sample of 783.

**Coder Training**

A written coding instrument, called a codesheet, was developed to code the sample \((N = 783)\), and a handbook for using the codesheet, known as a codebook, was written to guide coders in their analysis. (See Appendix A for the codesheet and Appendix B for the codebook.)

Three undergraduate coders were recruited to evaluate the content of the newspaper articles. Two training sessions were held. After practicing together, 11 percent \((n = 90)\) of the sample was randomly selected and coded independently (all three coded the same 90 articles for intercoder reliability). Software available at http://dfreelon.org/utils/recalfront was used to calculate Krippendorff’s alpha (Krippendorff, 1980; Krippendorff, 2011) for reliability, which ranged from .31 to 0.81 for each of the nominal level categories.
A reliability of 100% or 1.000 indicates high reliability, while low agreement is shown by 0.000 (Hayes & Krippendorff, 2007). Hayes and Krippendorff (2007) argue Krippendorff’s alpha is best suited for measuring reliability for content analysis. A modest degree of reliability is around .76 (Hayes & Krippendorff, 2007). According to Lombard, Snyder-Duch, and Bracken (2002), a reliability of .70 “may be appropriate in some exploratory studies in some indices” (p. 600). Krippendorff’s alpha was required to be .70 or higher for Lombard et al.’s (2002) study on intercoder reliability assessments and reports in mass communication research articles. Therefore, when beginning this study on Pennsylvania newspapers’ portrayals of Marcellus Shale gas drilling and development issues, a reliability of .70 was considered to be the best standard. However, many of the reliabilities were below .70 in this study. Due to the low reliabilities, caution should be exercised in interpreting the results reported.

Variables Measured

Demographic Information. Demographic information for each article coded includes newspaper, year, specific date, the section the article appeared in (business, political, news, or other), and whether or not the story was a wire story for the years 2008 (n = 36), 2009 (n = 51), 2010 (n = 218), 2011 (n = 297), and 2012 (n = 181).

The frames developed by Nisbet and Huge (2006) and their coding strategy was also employed. The Nisbet and Huge (2006) frames include scientific background; political strategies; public engagement; and public opinion. The environmental concerns and infrastructure concerns were added by the researcher to address issues such as water pollution and the effects on roads, two issues common in the discussion surrounding Marcellus Shale. The frames were coded as 1 = not present, 2 = present.
Sectors of Marcellus Shale Discussed. Several areas of the Marcellus Shale gas drilling and development were measured. Coders circled “1=no” or “2=yes” as to whether or not the following topics were present in the article: gas leases, well drilling and completion, gas companies, drilling water use, accidents, violations, public land, private land, ground water, waterways, community development, employment, impact on local businesses, drilling tax, tax revenue, legislation, public discussion, and government agencies.

Depiction of the Marcellus Shale Industry in Pennsylvania. Coders circled negative, neutral, or positive to indicate how the news article portrayed the industry. Thomson and Dininni (2005) found the tone of coverage on genetically modified organisms reflected the topic of coverage. Also, Haigh (2010) examined depiction of the alternative energy industry. However, Haigh (2010) employed a seven-point scale to determine whether an article was negative, neutral or positive. The current study used categories rather than an interval-level scale to examine the depiction of the Marcellus Shale industry.

Benefits and Risks. Coders circled “1=no” or “2=yes” as to whether or not benefits (environmental, economic, or human) or risks (environmental, economic, or human) were present. Thomson and Dininni (2005) found risks and benefits of agricultural biotechnology were discussed in articles, but one was not emphasized over the other.
Chapter 5

Results

The purpose of this study was to describe how newspaper articles in Pennsylvania portray issues related to the state’s Marcellus Shale gas drilling and development. Table 4 indicates the percent of stories from each paper examined. Figure 6 indicates the number of papers per year, with 4.6% of stories from the year 2008, 6.5% printed in 2009, 27.8% in 2010, 37.9% in 2011, and 23.1% in 2012.

Most articles appeared in the news section of the paper (81.2%), followed by the business

Table 4. Percentage of sample for each newspaper.

<table>
<thead>
<tr>
<th>Paper</th>
<th>Number of articles</th>
<th>Percent of total sample (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erie Times-News</td>
<td>26</td>
<td>3.3</td>
</tr>
<tr>
<td>Observer Reporter (Washington)</td>
<td>69</td>
<td>8.8</td>
</tr>
<tr>
<td>Pittsburgh Post-Gazette</td>
<td>161</td>
<td>20.6</td>
</tr>
<tr>
<td>Pittsburgh Tribune Review</td>
<td>142</td>
<td>18.1</td>
</tr>
<tr>
<td>Susquehanna County Independent and Weekender (Montrose)</td>
<td>25</td>
<td>3.2</td>
</tr>
<tr>
<td>The Herald (Sharon)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>The Times-Tribune (Scranton)</td>
<td>111</td>
<td>14.2</td>
</tr>
<tr>
<td>Daily and Sunday Review (Towanda)</td>
<td>69</td>
<td>8.8</td>
</tr>
<tr>
<td>The Daily Press (St. Mary’s)</td>
<td>18</td>
<td>2.3</td>
</tr>
<tr>
<td>Centre Daily Times (State College Times)</td>
<td>23</td>
<td>2.9</td>
</tr>
<tr>
<td>Harrisburg Patriot-News</td>
<td>50</td>
<td>6.4</td>
</tr>
<tr>
<td>Philadelphia Inquirer</td>
<td>68</td>
<td>8.7</td>
</tr>
<tr>
<td>Farm and Dairy (Salem, Ohio)</td>
<td>5</td>
<td>0.6</td>
</tr>
<tr>
<td>Lancaster Farming (Ephrata)</td>
<td>15</td>
<td>1.9</td>
</tr>
<tr>
<td>The Farmer’s Friend (Towanda)</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>783</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
section (8.9%). A majority of the articles (97.3%) appeared in mainstream papers. A majority of the articles were in the Marcellus Shale play (80.1%) with articles outside of the region at 19.9%.

Overall, 26.1% included a scientific background frame, 36.5% included a political strategy frame, 19.2% included a public engagement frame, 1.3% included a public opinion frame, 46.9% employed an environmental concerns frame, and 12.5% included an infrastructure concerns frame.

There were more than 18 topics coded as either being discussed or not present. The topics with the percentages of articles that included them are: gas leases (26.2%), well drilling and completion (30.8%), gas companies (50.3%), drilling water use (20.8%), accidents (13.8%), violations (10.1%), use of public land (14.9%), use of private land (20.3%), ground water (23.2%), waterways (15.1%), community development (8.6%), employment (11.6%), impact on local businesses (12.3%), drilling taxes (13.8%), tax revenue (11.1%), Marcellus Shale legislation
(33.1%), public discussion about drilling (21.3%), and the involvement of government agencies (49.9%).

Descriptive statistics were used to analyze the top ten topics discussed, the most common benefits or risks, and the depiction of the Marcellus Shale industry. To answer Research Question 1, frequencies indicate the most common topics covered in news stories and the percentages of articles in which the topics were present were: gas companies (50.3%), government agencies (49.9%), legislation (33.1%), well drilling and completion (30.8%), gas leases (26.2%), groundwater (23.2%), public discussion (21.3%), drilling water use (20.8%), private land (20.3%), and waterways (15.1%). See Figure 7 for a year-by-year breakdown of the top ten topics and the percent of articles containing these topics. For Research Question 2, the most common benefit discussed was economic (34.1%), followed by human (21.6%), and environmental (8.4%). The most common risk discussed was environmental (51.9%), followed by human (30.5%), and

Figure 7. Top ten topics and percent of articles containing topics each year.
economic (11.6%). In analyzing Research Question 3, it was found that the Marcellus Shale industry was depicted in a neutral manner in 53.1% of stories, a positive manner in 16.2%, and a negative manner in 30.4%.

To examine significant differences with topics and frames, chi-square analyses were employed (see Table 5). When analyzing if the mainstream media would use a different frame than agriculture media when discussing Marcellus Shale (Research Question 4), significant differences were found for the scientific background frame, political strategies frame, and the public engagement frame. Scientific background was included in 25.5% \( (n = 194) \) mainstream articles and 47.6% \( (n = 10) \) articles in agriculture media for a total of 26.1% \( (n = 204) \) of articles. The political strategies frame was included in 37.2% \( (n = 283) \) of mainstream articles and 14.3% \( (n = 3) \) of agriculture articles included the frame, for a total of 36.5% \( (n = 286) \) articles. The public engagement frame was included in 18.7% \( (n = 142) \) of mainstream articles and 38.1% \( (n = 8) \) of agriculture articles for a total of 1% \( (n = 150) \) of articles.

When analyzing if story frame would differ based on location of newspaper (Research Question 5), significant differences were found for the scientific background frame. This frame

<table>
<thead>
<tr>
<th>Frame</th>
<th>( \chi^2 )</th>
<th>Degrees of Freedom</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Paper (mainstream or agriculture) (RQ 4)</td>
<td>Scientific Background</td>
<td>5.19</td>
<td>1</td>
</tr>
<tr>
<td>Type of Paper (mainstream or agriculture) (RQ 4)</td>
<td>Political strategies</td>
<td>4.62</td>
<td>1</td>
</tr>
<tr>
<td>Type of Paper (mainstream or agriculture) (RQ 4)</td>
<td>Public engagement</td>
<td>4.98</td>
<td>1</td>
</tr>
<tr>
<td>Location (in or out of shale play) (RQ 5)</td>
<td>Scientific Background</td>
<td>6.29</td>
<td>1</td>
</tr>
<tr>
<td>Time (RQ 6)</td>
<td>Scientific Background</td>
<td>12.71</td>
<td>4</td>
</tr>
<tr>
<td>Time (RQ 6)</td>
<td>Political strategies</td>
<td>11.56</td>
<td>4</td>
</tr>
<tr>
<td>Time (RQ 6)</td>
<td>Environmental concerns</td>
<td>18.93</td>
<td>4</td>
</tr>
</tbody>
</table>

*p is significant at or <0.05.
was included in 24.1% \((n = 151)\) of newspaper articles in the shale play and in 34.0% \((n = 53)\) of articles outside of the shale play, for a total of 26.1% \((n = 204)\) of all newspaper articles including the scientific background. The majority of articles did not include the scientific background frame.

When analyzing if story frame would change over time (Research Question 6), significant differences were found for the scientific background frame, political strategies frame, and environmental concerns frame. The scientific background frame was found in 33.3% \((n = 12)\) of articles in 2008, 34% \((n = 17)\) in 2009, 70 32.1% \((n = 70)\) in 2010, 19.9% \((n = 59)\) in 2011, 25.4% \((n = 46)\) in 2012, for a total of 26.1% \((n = 204)\) of articles. A majority of articles (73.9%) did not include the scientific background frame. The political strategies frame was included in 33.3% \((n = 12)\) in 2008, 44% \((n = 22)\) in 2009, 43.6% \((n = 95)\) in 2010, 35.7% \((n = 106)\) in 2011, and 28.2% \((n = 51)\) in 2012 for a total of 36.6% \((n = 286)\) of articles. The majority (63.4%) of articles did not include political strategies. The environmental concerns frame was found in 47.2% \((n = 17)\) of articles in 2008, 48% \((n = 24)\) in 2009, 43.6% \((n = 95)\) in 2010, 48.8% \((n = 145)\) of articles in 2011, and 33.7% \((n = 61)\) of articles in 2012 for a total of 46.9% \((n = 367)\) of articles including environmental concerns. Over half (53.1%) of articles did not include environmental concerns.

To examine if topics discussed in the newspaper articles would change over time (Research Question 7), the top ten topics were examined by year (see Table 6). Significant differences were found for the topics: gas companies, Marcellus Shale legislation, well drilling and completion, gas leases, and use of private land. The topic of gas companies was included in 69.4% \((n = 25)\) of articles in 2008, 80% \((n = 40)\) in 2009, 53.7% \((n = 117)\) in 2010, 44.4% \((n = 132)\) in 2011, 44.2% \((n = 80)\) in 2012, for a total of 50.4% \((n = 394)\) articles. The topic of Marcellus Shale legislation was included in 38.9% \((n = 14)\) in 2008, 42% \((n = 21)\) in 2009, 36.2% \((n = 79)\) in 2010, 35.4% \((n = 105)\) in 2011, 22.1% \((n = 40)\) in 2012, for a total of 33.1% \((n = 259)\)
articles. A majority (66.9%) of articles did not include legislation. The topic of well drilling and completion was included in 41.7% \((n = 15)\) of articles in 2008, 56% \((n = 28)\) in 2009, 32.1% \((n = 70)\) in 2010, 24.9% \((n = 74)\) in 2011, and 29.8% \((n = 54)\) in 2012, for a total of 30.8% \((n = 241)\) of articles including well drilling and completion. A majority (69.2%) of articles did not include well drilling and completion. The topic of private land was included in 41.7% \((n = 15)\) of articles in 2008, 24.0% \((n = 12)\) in 2009, 21.6% \((n = 47)\) in 2010, 16.8% \((n = 50)\) in 2011, and 19.3% \((n = 35)\) in 2012 for a total of 20.3% \((n = 159)\) of articles.

Gas lease stories were included in 61.1% \((n = 22)\) in 2008, 46% \((n = 23)\) in 2009, 38.5% \((n = 84)\) in 2010, 16.2% \((n = 48)\) in 2011, and 15.5% \((n = 28)\) in 2012, for a total of 26.2% \((n = 205)\) of articles. The percentage decreased every year. A majority (73.8%) of stories did not include gas leases. The topic of private land was included in 41.7% \((n = 15)\) of stories in 2008, 24% \((n = 12)\) of stories in 2009, 21.6% \((n = 47)\) in 2010, 16.8% \((n = 50)\) in 2011, 19.3% \((n = 35)\) in 2012, for a total of 20.3% \((n = 159)\) articles including private land. A majority (79.7%) of articles did not include private land.

**Table 6. Significant differences in topics.**

<table>
<thead>
<tr>
<th>Topic</th>
<th>(\chi^2)</th>
<th>Degrees of Freedom</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over Time (RQ 7) Gas company</td>
<td>30.68</td>
<td>4</td>
<td>.000</td>
</tr>
<tr>
<td>Over Time (RQ 7) Legislation</td>
<td>13.87</td>
<td>4</td>
<td>.008</td>
</tr>
<tr>
<td>Over Time (RQ 7) Well Drilling and Completion</td>
<td>21.96</td>
<td>4</td>
<td>.000</td>
</tr>
<tr>
<td>Over Time (RQ 7) Gas Lease</td>
<td>76.21</td>
<td>4</td>
<td>.000</td>
</tr>
<tr>
<td>Over Time (RQ 7) Private Land</td>
<td>13.09</td>
<td>4</td>
<td>.011</td>
</tr>
<tr>
<td>Region (RQ 8) Gas Lease</td>
<td>4.23</td>
<td>1</td>
<td>.040</td>
</tr>
<tr>
<td>Type (mainstream and agriculture media) (RQ 9)</td>
<td>4.64</td>
<td>1</td>
<td>.031</td>
</tr>
<tr>
<td>Type (mainstream and agriculture media) (RQ 9) Public Discussion</td>
<td>5.94</td>
<td>1</td>
<td>.015</td>
</tr>
</tbody>
</table>

*p is significant at or <0.05.
When analyzing if there would be any differences in the topics covered by newspapers in the Marcellus Shale play compared to newspapers outside of the Marcellus Shale play (Research Question 8; see Table 6), significant differences were found for the following topic: gas leases. There were 24.6% \((n = 154)\) of articles in the Marcellus Shale play that included gas leases, and 32.7% \((n = 51)\) of articles outside of the Marcellus Shale play for a total of 26.2% \((n = 205)\) of articles that included gas leases. A majority (75.4%) of articles in the Marcellus Shale play did not include gas leases, and a majority (67.3%) of articles out of the Marcellus Shale did not include gas leases.

When analyzing if there would be any differences in the topics covered by mainstream media compared to those covered by agriculture media (Research Question 9; see Table 6), significant differences were found for the following topics: ground water and public discussion about drilling. Ground water was included in 22.7% \((n = 173)\) of articles in mainstream papers and in 42.9% \((n = 9)\) of articles in agriculture media for a total of 23.3% \((n = 182)\) articles including ground water discussion. Articles that did not include ground water discussion made up 76.7% of the sample. Public discussion was included in 20.8% \((n = 158)\) of articles in mainstream media 42.9% \((n = 9)\) articles in agriculture newspapers included discussion, with a total of 21.4% \((n = 167)\) of articles.
Chapter 6
Discussion

The story of using natural gas as an energy source in North America began in 1821 with William Hart’s 27-foot-deep well dug into Devonian Shale, which provided power for several buildings in Fredonia, New York (Harper, 2008; Harper & Kostelnik, n.d.a.). In the 1930s, drillers going to sandstone discovered that Marcellus Shale had a large flow of natural gas, but because the flow ran out quickly, they dismissed it as a viable source of energy (Harper, 2008; Harper & Kostelnik, n.d.a.). It was not until the late 20th century and early 21st century that technology to drill in the Marcellus Shale formation was developed and brought to Pennsylvania (Harper & Kostelnik, n.d.a.). The first Pennsylvania well, in Washington County, was drilled in 2004 and first began producing gas in 2005 (Harper & Kostelnik, n.d.b.). The newspapers were quiet on the issue until 2008, when the number of newspaper articles written on Marcellus Shale in Pennsylvania newspapers exploded in 2008, jumping from three articles in 2007 to 682 articles the next year (NewsBank, 2013).

According to Weigle (2011), Marcellus Shale became a polarizing issue in less than five years. This study examined five years of newspaper stories. This study is unique because it examines an issue that cropped up in the newspapers before the public had a chance to discuss it. According to Kelsey (personal communication, June 2013), public discussion was not prevalent prior to the Marcellus Shale industry becoming so prevalent in Pennsylvania, and government legislation, the media, and public policy had to catch up with the industry’s actions. Unlike the Haigh (2010) study on alternative energy, the Thomson and Dininni (2005) study on agricultural biotechnology, or the Nisbet and Huge (2006) study on plant biotechnology, topics which were well-established in the media, this study on Marcellus Shale in the newspaper followed the development of stories from the beginning of their appearances in newspapers and takes a look at
how newspaper articles portrayed issues surrounding Marcellus Shale beginning in 2008, the year
the number of articles exploded (NewsBank, 2013).

To conduct the study, 783 articles from 15 Pennsylvania newspapers from around the
state were analyzed. These articles focused on aspects of Marcellus Shale gas drilling and
development and were written by reporters for local newspapers, the Associated Press, or United
Press International.

Overall, legislation, gas companies, the environment and economics were the main
focuses of the newspaper articles. The study also found more than half of the newspaper articles
were neutral in their depictions of the Marcellus Shale industry. Economic benefits were
highlighted, while environmental risks were most prominent.

The top ten topics and the percentage of newspaper articles in which they appeared
(Research Question 1) were gas companies (50.3%), government agencies (49.9%), legislation
(33.1%), well drilling and completion (30.8%), gas leases (26.2%), ground water (23.2%), public
discussion (21.3%), drilling water use (20.8%), private land (20.3%), and waterways (15.1%).
The top three topics deal with the companies, regulatory bodies, regulations, and well drilling and
completion dictating how the process of the well drilling and the issues surrounding it. Three
more topics deal with water, which has been a great concern because of accidents, violations,
chemicals used during hydraulic fracturing, and concern over where the water for hydraulic
fracturing will come from. Finally, public discussion, private land, and gas leases deal with the
individual’s role in Marcellus Shale gas drilling and development.

For Research Question 2, the most common benefit discussed was economic, followed by
human and then environmental. The most common risk discussed was environmental, followed
by human and then economic. This finding suggests that economic and environmental factors are
at odds with each other, at least as portrayed in the media. This portrayal is not surprising, as
those for are in favor of hydraulic fracturing often tout the economic benefits, while those who are against hydraulic fracturing highlight the environmental risks.

In the Thomson and Dininni (2005) study of coverage of agricultural biotechnology, it was found that risks were highlighted in discussions about genetically modified organisms. While this study did not include a chi-square analysis to compare the topics and the risks discussed, most likely, the environmental risks were discussed in articles that also included topics dealing with water.

Decisions on scientific issues need to be made, but people may not have the relevant information needed to make that decision (Weigle, 2011). In Weigle’s (2011) study, residents believed there was not enough information and some was biased and tainted. In contrast, the results of this study showed that 53.1% \((n = 416)\) of articles depicted the Marcellus Shale industry in a neutral way (Research Question 3). Articles portraying Marcellus Shale negatively made up 30.4% \((n = 238)\) of the sample, and 16.2% \((n = 127)\) of articles portrayed Marcellus Shale in a positive way.

In examining the differences between frames used in mainstream and agriculture media (Research Question 4), scientific background, political strategies and public engagement were found to be significantly different. In agriculture media, 47.6% \((n = 10)\) of articles used a scientific background frame. In mainstream media, only 25.5% \((n = 194)\) of articles were framed using the scientific background frame. The number could be high for the scientific background frame in agriculture media because many audience members may have been landowners in rural areas where the drilling was taking place. These landowners would need background on the drilling process in order to wisely make a decision about leasing their land and mineral or oil rights. For the political strategies frame, 37.2% \((n = 283)\) of mainstream articles and 14.3% \((n = 3)\) of agriculture articles used the frame, for a total of 36.5% \((n = 286)\) articles. The number of articles employing a political strategies frame could have been higher in the mainstream articles.
because information on public policy is of general interest. Certain policies may be targeted for an agricultural audience, but a broad audience is interested in public policy such as state legislation on drilling taxes and local ordinances regarding zoning. Articles using a public engagement frame were 18.7% \( (n = 142) \) of mainstream and 38.1% \( (n = 8) \) of agriculture articles for a total of 1% \( (n = 150) \) of articles. Percentages could be higher in agriculture articles because of reports on topics covered in workshops held by Penn State Extension. In sorting through the articles, the researcher noted anecdotally that there are more stories about Extension workshops in agriculture media than in mainstream media, and this may account for the higher percentage in stories that included the public engagement frame.

It was surprising to see that there was only one significant difference between regions in the frames used (Research Question 5). The only significant difference was in the scientific background frame. This frame was included in 24.1% \( (n = 151) \) of newspaper articles in the shale play and in 34.0% \( (n = 53) \) of articles outside of the shale play, for a total of 26.1% \( (n = 204) \) of all newspaper articles including the scientific background. Perhaps those who lived outside the region needed more scientific background as they were not heavily involved in the industry, similar to Haigh et al.’s (2008) study of United States newspaper coverage of mad cow disease. In that study, it was found that articles on the coasts use human health frames. Haigh et al. (2008) attributed this choice to readers on the coasts lacking familiarity to the beef industry, and facts about the industry common to those living in the Midwest were not as common to those living on the coasts. The results of this study also reflect Haigh’s (2012) study on food recalls, which found that the scientific background frame was used in stories about spinach recalls, possibly because “people needed to understand how spinach progresses from farm to table” (Haigh, 2012, p. 71).

In analyzing what frames and topics changed over time (Research Questions 6 and 7), significant differences were found for the scientific background, political strategies, and environmental concerns frames and for the topics gas companies, legislation, well drilling and
completion, gas leases, and private land. The number of articles employing the scientific background frame remained steady from 2008-2010, dropping off in 2011. At the beginning of the Marcellus Shale drilling process, a newspaper audience would need background information on the techniques used for hydraulic fracturing and other drilling processes to become familiar with the Marcellus Shale process. This information would be especially important for landowners who needed to make decisions on leasing land and mineral or oil rights. As time went on, the articles would not need to include as much information on scientific background because the audience would have an increased knowledge of how drilling worked.

The number of articles employing the political strategies frame were at a high in 2009 with 44.0% ($n = 22$) of articles including the frame. The number of political strategies articles decreased each year after 2009. The reason for this decrease is unclear as Act 13 was a major political event in 2012. The political strategy frame also was used in stories about food recalls and may have contributed to political entities passing the Food Safety Modernization Act in 2010 (Haigh, 2012). Similarly, articles containing the political strategies frame could have contributed to political action.

The environmental concerns frame was included in nearly half of all articles from 2008-2011, with its high point in 2010 with 55.0% ($n = 120$) of articles including the frame. Then, the number declined in 2012 to 33.7% ($n = 61$). These numbers correspond with significant events occurring. In 2009, the well-known Dimock well contamination occurred where 14 water supplies became unusable and Cabot was sued by 15 families (Governor's Marcellus Shale Advisory Commission, 2011; StateImpact, n.d.a.). In 2010, another well blew out and caused contamination (Governor’s Marcellus Shale Advisory Commission, 2011) and the Pennsylvania DEP passed regulations that required companies to adhere to total dissolved solids standards for safe drinking water and that required a 150-foot buffer between streams and wells (Pennsylvania...
DEP, 2011). These and other events contributed to prominence of the environmental concerns frame.

The change over time in newspaper articles discussing gas leases was most prominent because the percentage of articles started high, at 61.1% \( (n = 22) \) in 2008, and then decreased every year. In 2009, the number of stories decreased to 46.0% \( (n = 23) \), to 38.5% \( (n = 84) \) in 2010, to 16.2% \( (n = 48) \) in 2011, and to 15.5% \( (n = 28) \) in 2012. In 2008, the explosion of newspaper articles on Marcellus Shale had just begun (NewsBank, 2013) and landowners needed to know the specifics of the leasing process, so presentations by economic experts were developed (Greevey, 2008; Pifer, 2008). The high number of articles discussing gas leases could be attributed to a need for information on how landowners could work with the gas companies and experience the most economic gain. Over time, the audience learned about the gas lease process through many sources, and not as many newspaper articles needed to be dedicated to the subject.

The topic of gas companies was included in 69.4% \( (n = 25) \) of articles in 2008, 80% \( (n = 40) \) in 2009, 53.7% \( (n = 117) \) in 2010, 44.4% \( (n = 132) \) in 2011, 44.2% \( (n = 80) \) in 2012, for a total of 50.4% \( (n = 394) \) articles. These are some of the highest percentages seen in the evaluation of topics included in these articles, not surprising seeing as gas companies was the topic discussed most often. Gas companies were prominent because they were conducting well drilling and completion, talking to landowners for gas leases, and carrying out many other activities related to Marcellus Shale gas drilling and development.

The topic of Marcellus Shale legislation was included in 38.9% \( (n = 14) \) in 2008, 42% \( (n = 21) \) in 2009, 36.2% \( (n = 79) \) in 2010, 35.4% \( (n = 105) \) in 2011, 22.1% \( (n = 40) \) in 2012, for a total of 33.1% \( (n = 259) \) articles. Just as in the political strategies frame, the reason for 2012 having the lowest number of articles is unclear as Act 13 was a major political event in 2012.
The topic of well drilling and completion hit a high point in 2009 when it was included in over half (56%) of that year’s articles. The number of wells had jumped from 335 drilled in 2008 to 819 drilled in 2009 (Pennsylvania Department of Environmental Protection, 2013b). The number of wells drilled continued to increase through 2011, and then the number decreased into 2012. The articles discussing well drilling and completion follow an inverse pattern: the number decreased from 2009-2011, and then increased slightly into 2012. The increasing number of articles could be an effect of the decreasing number of wells from 2011-2012 as newspapers discuss the fact that number of wells being drilled is declining. The number of articles addressing the topic of private land decreased each year from 2008-2011 before increasing slightly in 2012. The reason for this could be similar for the reason that the gas leases topic decreased every year: in 2008, landowners needed to know more about private land and its role in the Marcellus Shale industry than they did as time went on.

Gas leases was the only topic with a significant difference in media coverage between the Marcellus Shale region and the area outside of the region (Research Question 8). It was not surprising to see that there was a significant difference between regions in reporting on gas leases. This is a topic that those living in the Marcellus Shale region will be more heavily interested and invested in than those living outside of the Marcellus Shale region. In this area, it appears the media were using a bottom-up approach to their agenda (McCombs, 1997). The public in the shale play needed to know about gas leases because landowners had the chance to gain economically. However, because gas leases could not be enacted outside of the shale play, the public would not benefit from an article in the newspaper about gas leases. Therefore, newspapers outside of the shale play would not report heavily on the subject.

Ground water and public discussion about drilling were the two significantly different topics when examining mainstream and agriculture media (Research Question 9). Ground water also was one of the top ten topics discussed. Ground water was included in 42.9% (n = 9) of
agriculture articles, while only 22.7% \((n = 173)\) of articles in mainstream papers contained the topic. One reason agriculture articles could have had more ground water articles is the number of articles related to water contamination in cattle pastures. Public discussion was included in 20.8% \((n = 158)\) of articles in mainstream media 42.9% \((n = 9)\) articles in agriculture newspapers included discussion. The topic was likely significantly different because of the articles discussing workshops that Penn State Extension hosted. Extension was more likely to be discussed in the agriculture media because Extension is closely tied to agriculture.

Midwestern states are now beginning to see stories about hydraulic fracturing in their media. For example, one story in the Illinois AgriNews discusses gas leases and the question of contamination from wells (Williams, 2013). Gas leases is a topic that was most prevalent at the beginning of the news reporting in Pennsylvania. It would be interesting to see if news reporting on hydraulic fracturing in other states in the future follows a similar pattern as the reporting in Pennsylvania. As Haigh et al. (2008) discussed, the analysis of newspaper coverage of an agricultural issue “can be used as a guide for other agricultural issues that may receive major media coverage” (p. 58). Those states now experiencing drilling may look to what has already happened in Pennsylvania as a case study from which to derive examples for actions. The media influence the public, which in turn, influence public policy (Dearing & Rogers, 1996; Jordan & Page, 1992).

The high point of Marcellus Shale gas drilling and development coverage was hit in 2011, with nearly 38% of the articles appearing that year. There was a gradual increase from 2008 (4.6%) to 2009 (6.5%), and then the number rose sharply, with 2010 containing 27.8% of articles. After 2011, the number dropped off by over 14%, down to 23.1% of the articles in 2012. Comparing this information to Downs’ (1972) Issue-Attention Cycle, it appears that, in Pennsylvania, Marcellus Shale gas drilling and development is in the third stage, in which the public learns that significant progress will have a significant cost, or the fourth stage, in which
intense public interest gradually declines. In the third stage, the public sees that the problem or issue about which they became zealous in the second stage will require many resources in order to find a solution. In the fourth stage, the public reacts to the realization of the high cost of a solution by becoming discouraged or threatened by the great cost of the solution. They also may become bored by the issue. Meanwhile, during the fourth stage, the public’s attention is grabbed by another issue. Because of the number of articles decreasing from 2011 to 2012, the news cycle focusing on Marcellus Shale issues is most likely in the third stage or just about to enter the fourth stage. In the future, the talk about Marcellus Shale in the newspapers will die away as the public and the media focus on a new subject. Even though the discussion may not be as intense as it has been through the five years of this study, the legislation that was enacted will still exist, and the problems that occurred will still need solutions. Just because an issue fades out of the spotlight because a new issue has cropped up in the fourth stage and the issue advances toward the fifth stage of Downs (1962) attention cycle doesn’t mean that all the events and issues surrounding that issue will cease to exist.

**Limitations, and Future Research**

A significant limitation is the fact that this study only examined newspapers (Sheafer, 2007). Newspapers are only one piece of the broad world of media that are available for public consumption. Websites, multimedia outlets such as YouTube, radio, and television are other avenues through which Marcellus Shale is discussed. Being able to examine all of these outlets would be a great advantage to a study on coverage of an issue.

Another significant limitation is the low reliability numbers for some of the areas coded, such as industry depiction, economic risk, and public opinion. Krippendorff’s alpha was calculated to be above the preferred reliability of .70 for only eight out of 34 categories. Taking
out categories below .70 would significantly hinder results reporting, so the categories were kept in for this thesis.

As seen in the Batrinou et al. (2005) and Center for Food Integrity (2012) studies, giving information on a subject affects opinions. Further research should examine the public opinion on Marcellus Shale drilling and development to see if there is a connection between opinion and the media, similar to the McCombs and Shaw (1972) study in Chapel Hill, North Carolina, which found a correlation between information presented in the media about political issues and the issues that were deemed important in the public’s eye.

Further study also could be merited to compare articles containing political strategies frames with the actions of political entities in the state. Haigh (2012) speculated that political discussions in the media during food recalls contributed to passage of the Food Safety Modernization Act. A study on Pennsylvania’s local and state policies enacted from 2008-2012 could show a connection between political actions and information presented in the media.

Bias is a term often applied to the media. With 53.1% of newspaper articles portraying the Marcellus Shale industry in a neutral way, perhaps the choices that the reporters make as far as what to include is different from what the public thinks should be included, so it’s therefore seen as bias. Further study would be needed to come to a definitive conclusion regarding biased reporting.

Finally, the same articles should be reevaluated to validate the results shown in this thesis. Higher reliabilities should be established and the articles coded for the same elements as were used in this study.
Thesis Summary

Marcellus Shale drilling and development became a polarizing issue in Pennsylvania in less than five years (Weigle, 2011) with thousands of news articles on the subject written by national, state, and local reporters (NewsBank, 2013). These stories can have an influence on how the public views the drilling because the media affect public opinion and community consensus (Bridger & Harp, 1990; Haigh, 2010; Jasperson, Shah, Watts, Faber, & Fan, 1998; McCombs, 1997). In turn, public opinion can affect public policy and other decisions made in a community (Dearing & Rogers, 1996; Jordan & Page, 1992). Examining how a topic is portrayed in the media can give a picture of what information the public has available when forming their opinions on that topic.

With limited time and space in a media publication (Entman, 2007; Shaw & Martin, 1992), journalists must make decisions on what issues and information will be presented within a news story (Haigh, Bruce, & Craig, 2008; Price, Tewksbury, & Powers, 1997). These decisions result in frames being used in order to simplify complex issues (Scheufele & Tewksbury, 2007). In framing, news content is organized into a story line or idea that gives meaning and context to an event or issue and influences how the audience interprets or understands the event or issue (Entman, 2007; Haigh et al., 2008; Scheufele & Tewksbury, 2007; Sheafer, 2007; Weaver, 2007).

The purpose of this study was to determine how Pennsylvania newspaper articles about Marcellus Shale drilling and development were framed. Research questions examined how frames and topics related to Marcellus Shale differed from year-to-year, between regions in Pennsylvania, and between mainstream media and agriculture media. The top ten topics discussed, the most common benefits and risks, the way the Marcellus Shale industry is portrayed in newspaper articles also were analyzed.
Overall, legislation, gas companies, the environment and economics were the main focuses of the newspaper articles. With over half of newspaper articles depicting Marcellus Shale in a neutral way, individuals can arrive at a conclusion without feeling pulled one way or the other.

The story of newspaper coverage of Marcellus Shale gas drilling and development is unique because the public learned about the industry largely through the newspapers, and public policy was enacted reactively, possibly in response to the stories written in the newspaper (T. Kelsey, personal communication, June 2013). Neff, Chan & Clegg Smith (2008) stated that greater awareness on an issue leads to action. Through the newspapers, the public can gain knowledge of an issue and decide what their opinions and subsequent actions should be.

Through framing, newspaper reporters can affect public opinion. Other communicators and educators can do the same. In order to effectively communicate with an audience, the information that is already given to them should be understood (Neff et al., 2008). Knowing what information the public already has will enable educators and communicators to more effectively deliver messages because they can fill in gaps in the public’s knowledge and start with what the public knows.
Appendix A

Codesheet

Coder:
1) 2) 3) 4) Intercoder

Article Number # ____________

Paper:
1= Erie Times-News 2= Observer Reporter
3= Pittsburgh Post-Gazette 4= Pittsburgh Tribune Review
5= Susquehanna Co. Ind and Wkender 6= The Herald (Sharon)
7= Times-Tribune (Scranton) 8= The Daily/Sunday Review (Towanda)
9= The Daily Press (St. Mary’s) 10= Centre Daily Times
11= Hamburg Patriot-News 12= Philadelphia Inquirer
13= Farm and Dairy 14= Lancaster Farming
15= The Farmer’s Friend

Date: 1=2008 2=2009 3=2010 4=2011 5=2012

Specific Date (i.e., 3/10/12): ______________________

Section the article appeared in:
1= Business
2= Political
3= News (state/local, any type of newspaper)
4= Other (list) ______________

Was this a wire story: 1 = No 2 = Yes

Marcellus Shale Study 2013 1

Frames employed:
Scientific Background: 1 = Not present 2 = Present
Political Strategies: 1 = Not present 2 = Present
Public Engagement: 1 = Not present 2 = Present
Public Opinion: 1 = Not present 2 = Present
Environmental Concerns: 1 = Not present 2 = Present
Infrastructure Concerns: 1 = Not present 2 = Present

Sectors of Marcellus Shale Discussed:
1. Gas leases 1 = No 2 = Yes
2. Well Drill & Comp 1 = No 2 = Yes
3. Gas Companies 1 = No 2 = Yes
4. Drilling Water Use 1 = No 2 = Yes
5. Accidents 1 = No 2 = Yes
6. Violations 1 = No 2 = Yes
7. Public Land 1 = No 2 = Yes
8. Private Land 1 = No 2 = Yes
9. Ground Water 1 = No 2 = Yes
10. Waterways 1 = No 2 = Yes
11. Comm. Devel. 1 = No 2 = Yes
12. Employment 1 = No 2 = Yes
13. Impact Local Bus. 1 = No 2 = Yes
14. Drilling Tax 1 = No 2 = Yes
15. Tax Revenue 1 = No 2 = Yes
16. Legislation 1 = No 2 = Yes
17. Public Discussion 1 = No 2 = Yes
18. Gov’t Agency 1 = No 2 = Yes

MAJOR ______________________

MINOR ______________________
Depiction of the Marcellus Shale Industry in PA:
1 = Negative    2 = Neutral    3 = Positive

Types of Benefits Discussed:
1. Environmental 1 = No 2 = Yes
2. Economic      1 = No 2 = Yes
3. Human        1 = No 2 = Yes

Types of Risks Discussed:
1. Environmental 1 = No 2 = Yes
2. Economic      1 = No 2 = Yes
3. Human        1 = No 2 = Yes
Appendix B

Codebook

Section of paper
Should be identified somewhere on the printout provided. Page numbers may also indicate, but usually it states section.

Wire Story
Should say associated press reports, usually will not have an author, and a lot of times will say AP Newswire – UPI

Frames:
If you have 1 – none of this was mentioned. Absent.
2 – It was mentioned. Present.

Scientific background – history of Marcellus Shale drilling and development

Political strategies – actions of political groups and individuals

Public engagement – town hall meetings, protests

Public opinion – story discusses public opinion toward Marcellus Shale – that of Pennsylvanians or residents of other states, someone not involved in government is quoted, poll results

Environmental Concerns – concerns about drilling effects on land, soil, water, air, plants, animals, humans

Infrastructure Concerns – concerns about drilling effects on roads, buildings, community development

Sectors of Marcellus Shale Discussed
Circle yes or no for each topic listed. Articles could discuss more than one topic.

1. Gas leases – companies leasing the land to drill, lease rates
2. Well drilling – describes drilling process, new well development
3. Gas companies – actions the gas companies take
4. Drilling Water Use – the use of water during drilling, water withdrawals from local streams, purchases of water from municipal water systems, etc.
5. Accidents – any detrimental occurrence related to drilling, such as a leak or spill above or underground or a well blow-out
6. Violations – gas companies breaking the rules or performing against code, incidents that may or may not result in an accident; not all violations result in an accident
7. Public Land – how public land is being affected by gas drilling
8. Private Land – how private land is being affected by gas drilling; includes farms, urban homes, suburban homes, rural homes
9. Ground Water – the effects of drilling on water used for human consumption
10. Waterways – the effects of drilling on rivers, streams, creeks
11. **Community development** – impact on community infrastructure: roads, buildings, local governments

12. **Employment** – reports on who works for the gas companies, numbers of people employed, workforce training

13. **Impact Local Bus.** – the impact on local businesses: e.g. hotels filling up because drillers need a place to stay

14. **Drilling tax** – the tax the gas companies pay in order to drill (includes Act 13)

15. **Tax Revenue** – the amount of money state or local governments receive from drilling

16. **Legislation** – local or state policy; includes regulations

17. **Public Discussion** – includes presentations, public meetings or forums related to Marcellus Shale

18. **Gov’t Agency** – Discussion of government agencies that oversee the gas drilling in Pennsylvania, such as DEP (Dept of Environmental Protection), DCNR (Dept of Conservation and Natural Resources), SRBC (Susquehanna River Basin Commission), DRBC (Delaware River Basin Commission)

**Types of benefits discussed**
Can be more than one

**Types of risks discussed**
Can be more than one

**Depiction of the Marcellus Shale industry in PA**
Similar to tone of article, think if after you read the article if you feel happy/sad/neutral about the Marcellus Shale industry.

**Terminology used to identify the well drilling process**
What terms are used within the article to identify well drilling?
References


Voices/2013/0222/The-shale-phenomenon-fabulous-miracle-with-a-fatal-flaw#.US1WHqwFGkU.mailto


