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## Landowner Perceptions of Oil and Gas Development in Mississippi and Policies Associated with Managing the Industry and Natural Resources

Rachael Carter

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Landowner perceptions of oil and gas development in Mississippi and policies associated  
with managing the industry and natural resources

By

Rachael M. Carter

A Dissertation  
Submitted to the Faculty of  
Mississippi State University  
in Partial Fulfillment of the Requirements  
for the Degree of Doctor of Philosophy  
in Forest Resources  
in the Department of Forestry

Mississippi State, Mississippi

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2018

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Advances in oil and gas drilling technologies have led to an on-shore shale boom in the United States. This has increased drilling on forest land and conflicts regarding the tradeoffs of this practice. This study examines the forest landowner perspective of oil and gas development on forest land, policies that regulate the industry, opinions of land use tradeoffs, and what influences landowner decision making. This study also examines the balance of power between federal, state, and municipal government regarding the regulation of the oil and gas industry.

A systematic random sample of 1200 landowners with more than 10 acres of land in six counties within the Mississippi portion of the, Tuscaloosa Marine Shale play were chosen, to receive a mail survey. Each of the selected counties have seen an increase in drilling in the past 5 years. The survey was designed using prior research of community perceptions, land use tradeoffs, energy development, and information from focus groups within the region.

Over 63% of landowners indicated that equal priority should be given to policies to protect the environment, and policies that increased economic returns from drilling. The

primary reason for owning forest land was to pass it down to future generations, and 80% indicated a willingness to participate in an oil and gas lease. However, only 71% of those who ranked hunting as a very important reason for owning land would agree to an oil and gas lease. Improving leasing and restoration practices were recommended most frequently by the landowners to improve the drilling process while water quality and protecting natural resource income were the greatest concerns to landowners. Over 54% responded that they have a friend or family member employed by the oil and gas industry, and yet still believed that more transparency, communication, and better leasing practices are needed.

Landowner values such as reasons for land ownership, economic stability, and potential community impacts, influenced decision making. Policy makers should be aware landowners are concerned about the need for policies that protect their property for investment and future generations, as well as benefit the local economy.

## DEDICATION

I would like to dedicate this document to Chad Carter, my husband, and my daughter Lila Carter for their continued support and inspiration. I would also like to dedicate this work to Dr. Cindy Morgan and Mrs. Peggy Carter who both sacrificed their personal schedules and time to help me and my family while I worked towards this goal.

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I also wish to express my gratitude to the Mississippi landowners that participated in this survey and also wish thanks to the Mississippi State University Forest and Wildlife Research Center for providing insight and guidance in this project. I wish to thank Dr. Wes Schilling, of Mississippi State University Department of Food Science and Health Promotion, for his assistance with statistical analysis.



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CHAPTER I  
PUBLIC PERCEPTIONS OF OIL AND GAS DEVELOPMENT IN MISSISSIPPI AND  
POLICIES ASSOCIATED WITH MANAGING THE INDUSTRY AND NATURAL  
RESOURCES

**1.1 Introduction**

Oil and gas drilling occur both on- and off-shore in the United States. According to the U.S. Economic Research Service natural gas production increased 47 percent from 2000 to 2011, while oil production increased 7 percent from 2007 to 2011. Advances in technology surrounding oil and gas drilling have led to what has been recognized as an on-shore shale boom in the United States and increases in drilling in other parts of the world not traditionally recognized as major fuel producing countries (Munasib and Rickman 2015). Technologies primarily responsible for this include horizontal drilling improvements and advances to hydraulic fracturing (Koplos et al. 2014). These technologies are not new, but these improvements are what have contributed to their widespread use. With increases in oil and gas drilling, countries are faced with the issue of tradeoffs such as balancing current resources and industries with positive and negative impacts of new development. One resource where oil and gas drilling has had global implications is forestry. Increases in drilling on both public and private forest lands

around the world have contributed to debates on how to balance these natural resources while securing new energy sources (Hoel and Sletten 2016).

Until recently, oil and gas drilling was increasing in South Mississippi, as in much of the United States. Drilling had slowed in Mississippi and many regions of the country due to world-wide decreases in oil and gas prices. Recent price increases may reverse this trend. Still, issues and debates remain prevalent due to rapid fluctuations in demand that occurs world-wide. This could cause a resurgence of on-shore drilling, or what is often described as the utilization of unconventional resources. Utilization of unconventional resources has the potential to improve the United States energy supply and therefore, energy security, but these technologies have presented challenges and concerns for the industry and other stakeholders. The possibility of this development occurring in Mississippi at increasing rates has led to concerns regarding changing infrastructure, workforce development, environmental precautions, societal and policy concerns and needs, and legal debates (Carter and Gordon 2015).

In Mississippi forestry, agriculture, and tourism and recreational activities including hunting and fishing have been among the strongest economic drivers in Southwest Mississippi where much of the oil and gas exploration has occurred in the state. This leads to a question of how will these activities and their associated industries be impacted with an increase in oil and gas activity. A lack of information makes it difficult for landowners and policymakers to make informed decisions regarding risk management in oil and gas development (Theodori 2009). For this reason it is important to determine stakeholder perspectives so that it can be determined what type of information is lacking and how best to meet this need. Forest landowners are a primary

stakeholder in Mississippi because of the prevalence of privately owned forest land in the Tuscaloosa Marine Shale area, an emerging shale play that has seen upswings in production during the period from 2009 through 2012 (Phillips 2013). This research study provides information for policy makers to improve decision making in regard to oil and gas development and utilization of unconventional resources.

This study explores landowner views on the importance of economic returns versus environmental protection, and how landowners perceive the importance of protecting their forest land investment and how that compares to their willingness to engage in oil and gas development. The study also investigates reasons for landownership and if these reasons impact the perception of oil and gas development. This was measured by assessing landowner willingness to engage in oil and gas leasing and their opinion of the leasing process. In summary, a primary focus of this study explains how local landowners perceive benefits of oil and gas production and how this compares to the level of importance of supporting environmental protection and conservation efforts. The study uses a comparative case study of oil and gas management policies and strategies used to balance tradeoffs, and a landowner perception study in Mississippi to help policy makers develop best management strategies.

### **1.1.1 Key study objectives:**

- (1) Identify and compare land use policies used to manage tradeoffs of oil and gas extraction in the United States, such as mineral rights regulations, pooling, and unitization, and the costs and benefits of these policies.



- (2) Identify and compare the balance of power between federal, state, and municipal environmental policies in the nine USDA Forest Service regions and how this impacts the adoption or rejection of environmental regulations.
- (3) Determine if forest landowner perceptions in Mississippi align with prior research on community perceptions or if there are new perspectives in regard to policy design, mineral rights, and land use management and how they influence land use decision making.

## **1.2 Literature Review**

### **1.2.1 Determining the Issues**

Oil and gas development on forest land is a controversial issue world-wide. Countries are divided over decisions on how to balance the need for domestic energy with those associated with maintaining their forest resources. Oil and gas development can contribute to local, state, and national economies by providing revenues, jobs, and political stability (Tunstall 2015). However, negative impacts such as potential losses of biodiversity and forest fragmentation have been found (Finer et al. 2008, Drohan et al. 2012). Debates in many countries include how to manage oil and gas extraction on publicly owned forests, and how best to protect forest resources. Solutions that resound in previous research are the need to determine best management practices (BMPs) and develop implementation strategies of these practices (Finer et al. 2008, Löschel et al. 2010, Foote 2012, Bazilian et al. 2013).

The forest resource perspective is particularly important because much of the world's energy reserves are located in shale plays beneath the world's forests and much of the world uses its forests to meet needs such as heating, cooking, timber, and hunting,

(Olcott 2009). Countries such as the United States, Canada, Russia, Peru, Ecuador, and many others hold forests that are recognized for the resources they provide but they also hold large oil and gas reserves (Finer et al. 2008, Löschel et al. 2010, Foote 2012). This leaves countries facing decisions as to how to balance the utilization of these resources with the need to preserve them.

Decision makers and special interest groups around the world are questioning who is actually bearing oil and gas development costs on forest land and who is receiving the benefits. Contrary to this is determining who bears the cost if a country chooses not to develop oil and gas resources. An example of this occurrence is in Ecuador. In 2007, the President of Ecuador announced that it would choose not to develop a portion of its oil resources that are located in the Amazon. The President of Ecuador challenged governments to change the way they looked at the value of property containing natural resources from simply what monetary gain could occur (Rival 2010). Rival discussed how Ecuador's citizens benefit more from choosing not to develop resources because they are able to preserve biodiversity and reduce climate change impacts by protecting the Yasuni National Park. The other side of the argument is that Ecuador is foregoing revenues, taxes, and jobs that oil and gas resource development could potentially generate.

Another aspect of oil and gas development on forest land is the issue of drilling and its impact on the forest environment. Research studies have focused on deforestation, habitat protection and management to protect biodiversity, emissions management and climate change, and land-use decision making (Finer et al. 2008, Drohan et al. 2012, Seidl and Lexer 2013, Meng and Ashby 2014, Hoel and Sletten 2016). Forest values of

amenities such as aesthetics and recreation are also important according to Clement and Chang (2011).

### **1.2.2 Land Use Policies**

Oil and gas drilling on forest land is a highly debated topic across the United States. In December 2016, according to The Columbus Dispatch (Ohio), the Bureau of Land Management auctioned over 700 acres for oil and gas drilling in the Wayne National Forest in Ohio amid protests from environmental groups (Renault 2017). This particular event illustrated the controversy over drilling on public lands (Diaz 2013, Boudet et al. 2014). However, similar conflicts have arisen over the use of drilling on private lands. Private land drilling has been noted to cause controversies in regions that have unconventional oil and gas resources with fear of environmental impacts such as water quality issues being at the forefront of debate (Jacquet and Stedman 2011, Perry 2012, Reid 2016). The issue of unconventional resource development leaves policy makers, such as elected officials and regulatory agencies, with decisions to make in regard to land use, economic development, and environmental protection, often with little information.

Past research has revealed two primary land use policy issues related to gas and oil extraction on private forest land; mineral rights and property rights. Specifically, this includes the severing of mineral rights from surface rights and practices known as pooling and unitization, which is the combining of acreage from different land parcels in an oil and gas lease (Flanery and Morgan 2011, Farrer et al. 2013, Holahan and Arnold 2013). In some states, such as Mississippi and Louisiana, mineral rights or the right to harvest minerals were separated from the rights to own or use the surface of the same

piece of property (Davis 2012, Trachtenberg 2012). In many states mineral rights supersede or hold precedence over surface rights. This means the mineral lien holder has the right to gain access to their minerals even if this may disrupt the land use of the surface bearer (Diaz 2013, Phillips 2013, Davis and Fisk 2014). Details of mineral laws vary from state to state, but the severing and sometimes selling of mineral rights, separate from the surface rights, has led to a great deal of controversy in oil and gas development (Flanery and Morgan 2011, Bopp 2015). For example, this can lead to questions in regard to tradeoffs surrounding production that include impacts such as increases in traffic on private land, surface disruption, fragmentation, and potential loss of biodiversity. The surface landowner bears the production costs, while the mineral holder receives the benefits of the lease. Research has also revealed that mineral rights owners do not always live in the local community (Paredes et al. 2015). This limits the positive benefits the local area receives from drilling.

Another aspect to be considered is that horizontal drilling is used more frequently now than in the past, causing the need for access to more land for a well than for its vertical counterparts. This does reduce the number of wells drilled, but may increase the number of land parcels required per well (Brantley et al. 2014). This has brought up concerns over fair leasing for landowners and economic and environmental decisions with regard to well spacing and drilling activity (Holahan and Arnold 2013). One debated topic in the literature is pooling and or unitization (Libecap and Wiggins 1985, Flanery and Morgan 2011). There is a difference between pooling and unitization, although sometimes they are used interchangeably. While pooling is used to follow regulations about well spacing, unitization is concerned with supply and improving efficiency.

Unitization is often voluntary (Libecap and Smith 2001, Flanery and Morgan 2011, Trachtenberg 2012).

Forest fragmentation is another issue with relevance to oil and gas development. One case study on this subject focused on Pennsylvania (Drohan et al. 2012). Increases in drilling in Pennsylvania, by using hydraulic fracturing to extract natural gas, has led to many questions regarding natural resource management and impacts of the practice on Pennsylvania forest land. Concerns about forest fragmentation include habitat disruption, loss of recreational areas, and loss of biodiversity. The process is being used in the state on both public and private land (Davis and Robinson 2012, Drohan et al. 2012, Smith and Ferguson 2013, Theodori et al. 2014).

Another aspect of evaluating tradeoffs with regard to forestry centers on the longevity of tree growth relative to biological and economic maturity and the amount of time it takes to see these results from changes in practices. It is important that decisions being made regarding oil and gas development on forest land keep this in mind. It takes time for practices to be adapted and then for them to have a lasting impact. This indicates that decision making intended to impact issues such as climate or biodiversity need to occur in the near future to be beneficial (Seidl et al. 2012).

In policy decision making in which monetary costs and benefits are not clear, policymakers must look at ways to determine values and costs of their decisions to justify them. In Southwest Mississippi, the natural environment has long been a site of recreational hunting and fishing, and a quiet way of life where individuals and families can enjoy the outdoors. In light of this, policymakers must take into account the value of land slated for drilling and ensure that both use and nonuse values are taken into account.

Measures need to be taken to monitor and minimize impacts during extraction processes. These issues bring to light the importance of including nonmarket valuation for policymaking.

Environmental and technological disciplines most frequently addressed in the literature, and that have a need for proper valuation, are the safety and potential environmental impacts of the drilling process, use of large amounts of water during hydraulic fracturing, and threats to water supplies and biodiversity. Issues such as how oil and gas drilling impact forest fragmentation, land use valuation, and land restoration have all been examined in prior research, but need to be more closely looked at and quantified since they differ from one area to another (Finer et al. 2008, Clement and Cheng 2011, Fourcade 2011, Drohan et al. 2012, Merrill and Schizer 2013, Brantley et al. 2014).

Research on environmental aspects of oil and gas development surrounds the impacts and/or the potential impacts on water quality (Theodori et al. 2009, Feuillette et al. 2016). This was due to two main necessities. One was the need for water resources to engage in the hydraulic fracturing process. During this process large amounts of water are mixed with a number of other chemicals and injected into the ground to stimulate the oil extraction process (Freeman 2013, Merrill and Schizer 2013, Vengosh et al. 2013). The second is the need to treat and store the water used for this process in an environmentally acceptable manner which often requires it to be shipped in and out of the drilling area. Concerns regarding water quality are the potential risks to aquifers, drinking water wells, and streams and other surface water due to spills on the surface (Cook and Grubert 2017). Due to the importance of the water quality debate the Clean Water Act of 1972 is examined as it applies to oil and gas extraction. The Clean Water Act was enacted in

1948 and then amended and again titled the Clean Water Act in 1972. This law was intended to set water quality standards to protect surface water (EPA 2017).

Multiple federal laws exist to manage water and air quality and dependent biodiversity. Laws such as the Clean Water Act, Clean Air Act, Endangered Species Act, and Coastal Zone Management Act were all created to preserve natural resources and regulate industries or actions that can impact the environment. According to the National Oceanic and Atmospheric Administration (NOAA), the Coastal Zone Management Act of 1972 was created to help manage the natural resources in coastal areas and create a balance between the preservation and utilization of these resources (NOAA 2017). The Coastal Zone Management Act, according to the Federal Register 2017, has served as a federal mechanism that enables states to manage energy related activities such as providing space for energy storage or the development of pipelines in coastal states.

The Endangered Species Act is also an important law in regard to oil and gas drilling on forest land. This law, enacted in 1973, was intended to protect endangered and threatened species and promote conservation (U.S. Fish & Wildlife Service 2017). This law was relevant to oil and gas development on forest land because of the potential for loss of habitat due to the extraction process. One such endangered species is the sage-grouse "*Centrocercus Urophasianus*". Much controversy has occurred in the United States in states such as Wyoming, because drilling is disturbing the habitat of this bird (Applegate 2014, Robbins 2013).

### **1.2.3 Landowner Perceptions**

It is vital that landowner perceptions be evaluated with regard to oil and gas development in the United States because, unlike most other countries where most

mineral rights are primarily owned by governments, in the U.S. approximately two-thirds of mineral rights are owned by private landowners or businesses (Reid 2016). Therefore, landowners are primary stakeholders in the development of oil and gas resources in the United States.

Survey questions in this study were based on prior research (Anderson and Theodori 2009, Theodori 2009, Theodori et al. 2014). These studies examined perceptions of local leaders and community members on hydraulic fracturing, oil and gas drilling, and waste disposal associated with this drilling process. These study results indicated respondents were concerned about impacts on water and infrastructure challenges such as road safety and housing needs.

Also, researchers have discovered that communication strategies often have only a minor influence on opinions because of the extreme polarization between the Democratic and Republican parties (Farrer, Holahan, and Shvestova 2013, Davis and Fisk 2014). Another influence, according to this research, is that factors regarding the economy have an effect on the importance of the environment. For example, if the economy is doing poorly, citizens are less likely to be as concerned about the environment. This is in alignment with Maslow's hierarchy of needs theory (Maslow 1943). This information can be found in Maslow (1943) and Cabbage et al. (1993) and includes:

1. Survival (physiological needs): food, shelter, clothing, health.
2. Security (safety needs): protection from danger and threat.
3. Social (belonging needs): friendship, acceptance, love.
4. Self-esteem (ego needs): self-respect, recognition, status.



5. Self-actualization (fulfillment needs): creativity, realization of individual potential.

These basic principles have been used by researchers to explain forest policy development. As a country or society becomes more developed and basic needs become more secure, the population begins to focus on values that fulfill self-actualization such as conservation and preservation or future use values (Duerr 1982). Research has also indicated that citizens tend to respond according to the most recent information they have, especially if it comes from a group or party they are affiliated (Brulle et al. 2012).

Research has indicated that certain factors influence public opinion of environmental policies more than others. Two factors studied in 2011 in a poll in the United States were media influence and partisan influence on opinions of climate change (Brulle et al. 2012). The conclusion was that citizens rely on political party beliefs or how reliable the level of trust is in their information source to influence their decisions (Brulle et al. 2012). This study examined party influence on views of oil and gas development and regulations.

A study, conducted in 2010 in Pennsylvania in Bradford and Tioga Counties, surveyed landowners concerning their experiences with oil and gas leasing (Ward et al. 2010). The study revealed 55% that had chosen to participate in an oil or gas lease would not sign their original lease if they now had the choice. These landowners believed that they did not receive enough monetary compensation or that they should have sought legal counsel before agreeing to lease. Landowners that were unsatisfied with their leases said they had only agreed to the stipulations because of pressure from their neighbors (Ward et al. 2010). According to the author, landowners had more concerns about their leases

than about drilling on their property or in their community. A study using GIS technology and survey data also indicated that there is a relationship between land values such as aesthetics and recreation and an opposition to oil and gas drilling (Sherrouse et al. 2011). Researchers agreed that more studies are needed to further explain relationships between land use values and perceived social costs.

Some similar work has taken place in Mississippi. Mississippi State University Extension held a series of workshops and focus groups to aid landowners and policy makers from 2013 – 2015 (Carter and Gordon 2015). Concerns that were recurring during focus group meetings and educational sessions included:

- Funding transportation infrastructure repairs and maintenance.
- Understanding and managing environmental impacts and safety issues.
- Ensuring landowners receive fair leasing conditions.
- Improving management of post drilling impacts and restoration.
- Creating a plan to utilize the local workforce.
- Eliminating negative impacts on other activities and industries such as hunting and fishing, agriculture, and forestry
- Determining how to manage water resources and establishing baseline testing and water resource management strategies.

These concerns and feedback from participants and stakeholders helped point toward a direction for future research (Carter and Gordon 2015).

The perceived economic benefits of oil and gas development on forest land can be summarized into employment increases, revenues from oil and gas sales, income to landowners or governments from leasing, potential lower energy costs, energy security, improved roads, and economic benefits of exporting oil and gas to other countries

(Kinnaman 2011, Munasib and Rickman 2015, Tunstall 2015). Increases in oil and gas activity due to unconventional methods such as hydraulic fracturing, and advanced horizontal drilling on-shore in the U.S. have led to an estimated 1.7 million jobs. In contrast, the industry may impact the local community, the environment, and other sectors negatively with increased truck traffic, need for water use, the pipeline footprint, and the potential for spills (Munasib and Rickman 2015).

According to Cabbage et al. (1993; 2017), issue networks play an influential role in the political process. This process is influenced by political parties, political ideology, and sharing of information (Boudet et al. 2014). A social identity theory (SIT), as it applies to stakeholder networks can be used to examine how these factors are influencing public perception and support of, or lack of support, for oil and gas development regulations and policies.

This study was completed in three phases using both existing data and new data collected through a mail survey. The reasoning behind this was to take advantage of existing and historical data to guide survey development and analysis of results. This study combined both qualitative and quantitative methods to create a holistic picture of the research questions and the results. It also examined data from national and state perspectives. The purpose was to provide information for policy makers to improve land use decision making by evaluating land use tradeoffs, perceptions of policies, development and effectiveness of land use policies, and impacts of oil and gas development on forest land. Below are three phases of research that were used to identify and compare tradeoffs and management strategies of unconventional resource development and to determine perceptions of these tradeoffs and management policies at

the landowner level. These phases of research were used to determine best management practices and aid policy makers with decisions regarding development.

**Phase I** – A comparative analysis of environmental natural resource policies used to balance tradeoffs regarding oil and gas development in the nine USDA Forest Service regions. This included a review of how states apply environmental laws and regulations of the oil and gas industry such as the Clean Water Act, Multiple Use and Sustained Yield Act, and Endangered Species Act.

**Phase II** – A case study analysis of mineral and landownership rulings, pooling, and unitization, and how this impacts the oil and gas leasing process in states that are actively engaged in oil and gas production.

**Phase III** –A Landowner Perception Study was used to determine land use values and perceptions of policies regulating the oil and gas industry and how perceived concerns and benefits align with those of Mississippi landowners versus citizens in other states that have experienced drilling.

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CHAPTER II  
DIVISION OF AUTHORITY IN OIL AND GAS POLICY: ANALYSIS OF  
MUNICIPAL, STATE, AND FEDERAL ENTITIES

**2.1 Introduction**

Onshore oil and gas drilling is a highly debated topic across the United States. In December 2016, according to The Columbus Dispatch (Ohio), the Bureau of Land Management (BLM) auctioned over 700 acres for oil and gas drilling in the Wayne National Forest in Ohio amid protests from environmental groups (Renault 2017). This particular event illustrated the controversy over drilling on public lands (Diaz 2013, Boudet et al. 2014). Similar conflicts have arisen over the use of drilling on private lands. Private land drilling has contributed to controversies in regions that have unconventional oil and gas resources with fear of environmental impacts on water quality issues being at the forefront of the debate (Jacquet and Stedman 2011, Perry 2012, Reid 2016). The rise of unconventional resource development leaves policy makers, such as elected officials and regulatory agencies, with decisions to make in regard to land use, economic development, and environmental protection, often with little information as to how to balance these tradeoffs.

Oil and gas drilling on public and private forest land has become more commonplace in the last 10 years due to improvements in drilling technologies allowing

access to onshore unconventional resources (Holahan and Arnold 2013). With these new developments new challenges have become apparent because technologies such as horizontal drilling and hydraulic fracturing sometimes impact larger areas of land, require more water usage, and call for an increase in truck traffic (Vengosh et al. 2013).

Oil and gas development on forest land is a complex issue with opposing stakeholders often debating on how to manage natural resources. This study provides an overview of how states are implementing strategies to manage oil and gas development as well as settle land use disputes in nine of the USDA Forest Service (USFS) Regions. This analysis will evaluate both conflicts regarding drilling on federal, state, and municipal property and how these conflicts have been met. The processes that have been used for balancing these resources provide examples of systems used in the United States to assess energy development, utilization of resources, and preservation our Nation's forest lands and associated watersheds for future use.

Federal policies exist to manage resources on both public and private lands, but conflicts occur as to how these policies should be implemented at the state and municipal level. Disputes between federal, state, and municipal governments have occurred in many states concerning which government entity has the authority to make decisions regarding oil and gas drilling when there is a lack of an overarching consistent federal policy. This study discusses problems that have occurred when federal, state, and municipal governments attempt to resolve disputes and determine how best to apply strategies to balance environmental and social impacts and economic returns associated with the industry.

## 2.2 Methods

For the purpose of gaining a broad representation of the issue under examination, the implementation of natural resource management laws and strategies as they apply to oil and gas management will be examined in each of the nine USFS Regions. Under the USFS delineation of forest land, the country is divided into nine Regions consisting of the Alaska, Eastern, Intermountain, Northern, Pacific Northwest, Pacific Southwest, Rocky Mountain, Southern, and Southwestern Regions (need citation USDA FS date for reference?). The study area will focus on one sample state in each of these Regions (Figure 1).

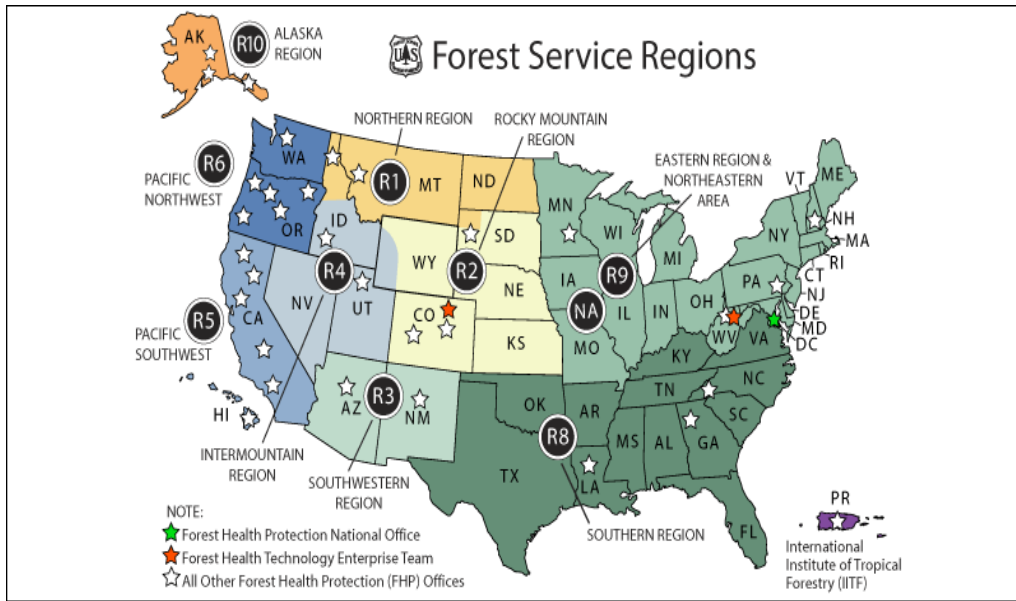


Figure 2.1 USDA Forest Service Regions as Associated Study States.

This study consisted first of an overview of federal environmental policies and the governmental processes for regulating oil and gas policy. Laws such as the Clean Water Act, Clean Air Act, Oil Pollution Control Act, Endangered Species Act, Multiple-Use Sustained Yield Act, and the National Forest Management Act were examined regarding what role they play in managing the industry. Next federalism, and the divisions of

government including the federal government, state governments, and municipal governments and their roles in regulating oil and gas drilling were discussed. Each of the nine USDA Forest service regions were examined regarding their location, size, and natural resources such as forest land and scenery. Next a sample state was selected in each of the regions. Each state's primary energy sources and production levels, and their role in the United States energy sector were discussed. Disputes between levels of government in each state regarding oil and gas policies and how these issues were settled were identified and discussed. These disputes were identified by conducting a thorough literature review of oil and gas policy development, a review of popular news media stories, and a review of relevant legal cases, and briefs using the Westlaw database, for each of the sample states. Trends regarding these disputes and how the courts were used to manage these issues were identified and compared. Comparisons were made between the regions to find cases where issues were resolved effectively as well as how the courts are used to balance power between the federal, state, and municipal governments regarding onshore oil and gas regulation.

### **2.3 United States Governmental Structure and Balance of Power**

The oil and gas industry is regulated on a state-by-state basis, but all activity must adhere to federal laws pertaining to water and air quality, pollution control, and endangered species (Gaffhey 2007, Wiseman 2009, Krupnick et al. 2017). The exception is oil and gas extraction taking place offshore or on federal lands (Krupnick et al. 2017). These resources are managed by federal government entities such as the Department of the Interior, Bureau of the Safety of the Environment, and Bureau of Ocean Energy Management (Applegate and Owens 2014, Krupnick et al. 2017). Policies used to

manage onshore oil and gas development and how they are adopted at the state level are an excellent example of how the United States political system works. There are various actors or stakeholders with different views who want their needs met. Policies are developed at the federal level to solve a resource issue. Sometimes they have the desired effect, sometimes policies must be adapted, and sometimes there is a need for balance between federal and state government for more stakeholders or actors to be involved and eventually satisfied.

### **2.3.1 Federalism**

Federalism in the United States is the division of power between the federal and state government (Patterson 2001). This balance of power and structure was designed to prevent tyranny and is played out in the management of the oil and gas industry and tradeoffs associated with its development (Vision 1998, Lin 2014). Cooperative federalism is the relationship between the national and state government and occurs often in the case of environmental laws where federal and state power work together to address needs (Fischman 2005, Burlison 2012).

The United States not only seeks to maintain a balance of power between the executive, legislative, and judicial branches of government, but there also is a separation of powers between the federal, state, and local governments (Spence 2013, Lin 2014, Mumby 2017). In this analysis, local government will refer to municipal or county governments. In the case of oil and gas policy, and also in a larger spectrum, natural resource policy, laws are developed at the federal level, but are often then left to the states as to how these policies will be implemented or adhered to. Oil and gas regulation like many other land use policies are primarily regulated by state laws, yet federal laws

serve as a floor for policy development and can be utilized as a final regulatory tool (Fischman 2005, Cabbage and Newman 2006, Weynand 2014). For example, according to past studies, there is no single federal law or agency responsible for managing and regulating the oil and gas industry ( Rahm 2011, Brady and Crannell 2012). Multiple laws and policies exist that influence how oil and gas resources can be obtained, each with a separate purpose and often overseen by varying agencies in the federal government (Burkhardt and Holm 2003, Gaffhey 2007, Brady and Crannell 2012, Ryder 2017). Each state is then left to manage their oil and gas resources on either state owned, municipal, or county owned land or private property.

Multiple policies and laws have been enacted to balance the Nation's natural resources on forest land at the federal level including the National Environmental Policy Act (NEPA, 1969), Clean Water Act (1972), Clean Air Act Amendments (1980), National Forest Management Act (1976), Endangered Species Act (ESA, 1974), Multiple-Use Sustained Yield Act (MUSYA), and Mineral Leasing Act (Cabbage and Newman 2006, Diaz 2013, Robbins 2013, Pendery et al. 2018,).

While federal government is responsible for regulating oil and gas activity on federal and tribal lands, when drilling occurs on private land or on municipal property the issue becomes even more complex (Diaz 2013, Fry 2013, Fry et al. 2015, Ryder 2017). Issues such as externalities, public goods, and costs and benefits of production all come into play (Libecap and Smith 2002, Centner and Kostandini 2015). Multiple federal laws exist to govern fracking, but each of these laws plays a different role (Gaffhey 2007, Malmedal et al. 2007, Diaz 2013, Robbins 2013). Subsequently, the decisions of how to implement these laws are primarily left to the states in which the activity is occurring

(Ritchie 2014, Centner and Kostandini 2015). State laws have held precedence in the courts in many cases, but many municipalities have enacted ordinances in their communities to address issues that their citizens have protested against (Apple 2014, Scobie 2015).

## **2.4 Federal Resource Management Policies**

Multiple federal laws exist to manage water and air quality and biodiversity, all with relevance for oil and gas development. Laws such as the Clean Water Act, Clean Air Act, Endangered Species Act, and Multiple-Use Sustained Yield Act were all created to preserve natural resources and regulate industries or actions impacting the environment (Burkhardt and Holm 2003, Gaffhey 2007). According to the National Oceanic and Atmospheric Administration (NOAA), the Coastal Zone Management Act of 1972 was created to help manage the natural resources in coastal areas and create a balance between preservation and utilization of these resources (NOAA 2017). These federal policies among others have been developed to manage oil and gas not only on federal lands, but on state-owned and private lands. While states have the authority to regulate oil and gas resources in their respective states, they still must adhere to these overarching federal guidelines.

The federal government is responsible for regulation oil and gas resource management on all federal and tribal lands according to the Mineral Leasing Act (Pendery et al. 2018). The Mineral Leasing Act allows the Bureau of Land Management (BLM) not only to lease land for oil and gas development, but to also retain the right to oversee and manage drilling processes to minimize environmental impacts. The BLM has the authority to halt drilling and require changes in practices to prevent, mitigate, or



repair environmental impacts (Pendery et al. 2018). This causes difficulty when determining how to manage disputes in regard to development of this industry (Greenberg 2009, Diaz 2013, Minor 2014). Disputes continue when drilling or activity occurs within city or county government regions when elected officials are seeking to address complaints from their constituents (Weible and Heikkila 2016).

#### **2.4.1 Federal Water Pollution Prevention and Control Act**

Research on environmental aspects of oil and gas development surrounds the impacts and/or the potential impacts on water quality (Theodori et al. 2009, Feuillette et al. 2016). Hydraulic fracturing requires large amounts of water to be mixed with a number of chemicals and injected into the ground to stimulate the oil extraction process (Freeman 2013, Merrill and Schizer 2013, Vengosh et al. 2013). This water must then be treated or stored in an environmentally acceptable manner which often requires that it be shipped in and out of the drilling area. In areas where water resources are scarce disputes have occurred regarding where this water for hydraulic fracturing should come from and how can it be safely stored or treated ( Schizer 2013, Brantley et al. 2014, Scanlon et al. 2016, Kondash et al 2017)

Additional concerns regarding water quality that have been argued are risks to aquifers, drinking water wells, streams, and other surface water due to spills on the surface (Cook and Grubert 2017). Due to the importance of the water quality debate the Clean Water Act (CWA) of 1972 was examined as it applies to oil and gas extractions. The Clean Water Act was enacted in 1948 and then amended and titled the Clean Water Act of 1972. This law was intended to set water quality standards to protect surface water (EPA 2017b).

The Federal Water Pollution Prevention and Control Act is commonly known as the CWA. It was enacted in 1972 with additional amendments being made in both 1977 and 1987. The Act was created to address water pollution issues and to require a permitting process for any discharge into navigable waters (Dwyer and Bergsund 2002). CWA was intended to be primarily implemented by states, but to also enable the Environmental Protection Agency (EPA) to have final jurisdiction and veto power over a permitting decision (Gaffhey 2007). The CWA's 401 and 404 provisions designate the division of power on permitting decisions. Section 401 indicates that a permit must be obtained from the state for any discharge into navigable waters. Federal permits, however, will not be issued without state approval. If the waters are navigable then a state permit must be obtained first because navigable waters are owned by the state (Dwyer and Bergsund 2002). For example, in Mississippi for discharge into "State" jurisdictional waters and/or filling wetlands, a 404 permit request with the U.S. Army Corps of Engineers cannot be approved until a 401 permit request is approved by the Mississippi Department of Environmental Quality (MDEQ). MDEQ would have to issue a 401 permit before a 404 permit could advance through the approval process. The 404 process would also include a review by other federal agencies such as the USDI Fish and Wildlife Service (USFWS) prior to approval. For example, if the request is for an area in the three coastal counties of Mississippi then the permit request must be approved by the Mississippi Department of Marine Resources, before a 404 determination can be made. The CWA also is the source for the development of best management practices (BMPs) for state forests (Mississippi Forestry Commission 2018). BMPs for forestry are a way to

manage water and soil resources for multiple uses of the forest and watersheds, prevent environmental damage, and preserve resources for future use.

#### **2.4.2 Oil Pollution Control Act**

The Oil Pollution Control Act was enacted in 1990 after the Exxon Valdez oil spill. The purpose of this Act was to create liability for oil spills that occur in navigable waters, shorelines, or in a nearby area (Dwyer and Bergsund 2002). The Act applies to onshore and offshore facilities and holds the responsible party liable for clean-up and damages that occur because of a spill. The Act also establishes a trust fund for damages and reparations due to offshore spills (Dwyer and Bergsund 2002). Exxon was mandated to pay \$900 million in civil fines and \$100 million in criminal fines to contribute to restitution, a trust fund, and reimbursement of costs to federal and state agencies, according to the United States General Accounting Office (USGAO) (USGAO 1998).

#### **2.4.3 National Environmental Policy Act**

In 1969, NEPA was created leading to the Council on Environmental Quality. This Council initiates oversight of federal agencies with regard to actions that may have an environmental impact. The Act first requires agencies to conduct environmental assessments and quantify amenities and ecosystem services to improve decision-making. This may require them to prepare environmental impact statements (EIAs) before taking action on projects receiving federal dollars that could impact the environment (Dwyer and Bergsund 2002). According to Cabbage et al. (1993), the goal of this Act was to create a means of improving environmental quality, preserve cultural and natural resources, balance use and preservation of natural resources, and provide citizens with a healthy and safe environment. NEPA is a regulatory strategy that can be used to regulate

activities such as hydraulic fracturing (Merrill and Schizer 2013). NEPA is used by the courts as a means of requiring that changes be made to drilling activities if proper NEPA procedures are not being followed. NEPA has been used to place moratoriums on drilling activities (Shannon 2014; Askin 2007; Pendery 2010; Busenberg 2011) . The process occurs if a plaintiff has complaint against either an oil and gas company, or in some instances the state of federal governments for allowing drilling to occur without following NEPA regulations. The plaintiff is then able to file a suit against the defendant and the court system must determine if NEPA is being adhered to or if drilling activities should be altered or halted (Smith 2014, Pacheco 2015).

#### **2.4.4 The National Energy Policy Act**

The National Energy Policy Act was enacted in 2005 to address issues with energy supply in the United States. The Act allocates funding to encourage the development of technologies that reduce emissions and negative environmental impacts of energy development and improve domestic supplies of energy. This includes oil, gas, bioenergy, coal, geothermal energy, and many other sources of energy development in the United States (Malmedal et al. 2007).

#### **2.4.5 Endangered Species Acts**

The initial Endangered Species Act is also an important law with regard to oil and gas drilling on forest land. This law enacted in 1973 was intended to protect endangered and threatened species and promote conservation (USFWS 2017). It is relevant to oil and gas development on forest land because of the potential for habitat loss due to the extraction and distribution process. One such endangered species in Region 2 is the sage-grouse “*Centrocercus Urophasianus*”. Controversy has occurred in the United States in

states such as Wyoming, because drilling is disturbing the bird's habitat (Robbins 2013, Applegate 2014).

The ESA is designed to protect any endangered or threatened plant or animal species and their habitats necessary for their survival. It prevents the "taking" of these species without a special permit. A "take" includes anything that harms the species or their habitat in a way that could jeopardize their survival (Dwyer and Bergsund 2002). A habitat conservation program was designated by this Act and designed to improve habitats for endangered and threatened fauna and flora. The goal of the habitat conservation plans are to improve these areas to the point that the plants or animals can increase in numbers and eventually become delisted (Cubbage and Newman 2006). These habitat conservation plans are required on federal lands where endangered species habitat has been identified.

The ESA is one of the most impactful laws for the oil and gas industry, because it is not simply a permitting or monitoring process as the CWA, or the National Forest Management Act (NFMA; Gaffhey 2007, Robbins 2013, Pendery et al. 2018). This Act can actually halt drilling if it is slated to occur in habitat of an endangered species (Naugle et al. 2011, Applegate and Owens 2014). The BLM, which manages oil and gas leases on federal lands, came under fire because of issues related to the sage grouse habitat. Drilling leases were prevalent in what was considered to be bird habitat. Drilling has been limited in some areas because of restrictions in regard to this restriction (Krause and Cardwell 2015).

#### **2.4.6 Multiple Use Sustained Yield Act (MUSYA) and National Forest Management Act (NFMA)**

The MUSYA designates the USDA Forest Service to manage National Forests for multiple uses such as timber, recreation, preservation, and hunting (Dwyer and Bergsund 2002). The MUSYA designates that the United States Forest Service (USFS) manage its renewable resources to achieve a maximum sustainable yield, of these resources. The Act also mandates that this management not interfere with the harvesting of mineral resources (Dwyer and Bergsund 2002). The NFMA implements the principles of MUSYA, such as creating balance between the many forest resources, but it also designates the creation and adoption of Forest Management Plans to be submitted to the Secretary of Agriculture, that includes plans for mineral leasing managed by the BLM (Burkhardt and Holm 2003).

The MUSYA was created to make the USFS responsible for managing the Nation's forests in a manner that would create a reasonable balance between resource utilization, and preservation. This includes management for timber, wildlife, recreation, and minerals and create a reasonable and sustainable level of yield from renewable resources within its forests (Dwyer and Bergsund 2002). This MUSYA includes a statement indicating that renewable resource management of the forest was not to interfere with mineral extraction. The Act was then amended in 1974 (Dwyer and Bergsund 2002). This new Act, the National Forest Management Act was created to implement many guidelines mentioned in the MUSYA and included minerals as a part of the resources that needed to be balanced by USFS management (Burkhardt and Holm 2003).

The BLM under the Secretary of the USDI is responsible for the management of mineral resources on National Forests, but the Secretary of Agriculture and the USFS are responsible for monitoring the application of principles of the MUSYA and NFMA (Cubbage and Newman 2006). Implementation of forest management plans are monitored by the USFS and Secretary of Agriculture and serve as a system of checks and balances of resource uses between preservation, recreation, utilization of renewable resources, and mineral extraction (Burkhardt and Holm 2003, Cubbage and Newman 2006).

## **2.5 Overview of States Identified in Each USFS Region**

States selected for review in each of the nine USDA Forest Service Regions include North Dakota, Colorado, New Mexico, Utah, California, Washington, Texas, Pennsylvania, and Alaska (Figure 2). Energy production is important in the United States because of domestic needs for secure energy, revenues from production, and employment. However, forest resources are also important because of revenues and nonmonetary benefits from timber resources, recreation, hunting and fishing, ecosystem services, and future use. States with the highest levels of natural gas are Texas, Pennsylvania, and Colorado (EIA 2018b). Those with highest levels of crude oil production are Texas, North Dakota, and California (EIA 2018b). Case studies of each selected state portray the dynamics of their USFS region, a description of energy production in the state, and examples of conflicts between federal, state, and municipal governments.

Sample states have attempted to balance and manage the use of oil and/or gas resources; however, disputes that have occurred. In this regard the U.S. political system

has thereby been used to settle these resource issue disputes, most often through the court system. Disputes in the lower courts have been appealed and settled in higher courts with some cases favoring the oil and gas industry and some favoring citizen or environmental groups wishing to place limits on activity.



### **2.5.1 Region 1 Northern Region – North Dakota**

According to USFS, the Northern Region consists of approximately 25 million acres which includes 12 National Forests. The Region is home to diverse ecosystems, 16 Wilderness areas, six Scenic Rivers, and Scenic Trails (USFS 2018). According to the (EIA 2018b), North Dakota was the second-largest crude oil producer in the Nation in 2018. The state also has large amount of coal (6% of the United States supply) and wind resources making its production rate six times greater than its consumption rate (EIA 2018b). North Dakota has seen a rapid increase in drilling in recent years, particularly in the Bakken Shale Play (Munasib and Rickman 2015, Hearne and Fernando 2016). In North Dakota, the North Dakota Industrial Commission, Oil and Gas Division regulates oil and gas production. North Dakota has seen some conflicts in recent years between the federal, state, and tribal governments.

In North Dakota state leaders objected to the 2013 BLM regulations requiring oil and gas companies drilling on federal land to disclose fracking fluids (Lymn 2013). The objection was due to the state already requiring this disclosure. In general, North Dakota objected to the federal government increasing its involvement in state regulation of the oil and gas industry (Lymn 2013). The state leaders were opposed to the BLM requiring regulations that they were already handling at the state level and argued that they did not need federal involvement.

Also in North Dakota, a dispute between the Standing Rock Sioux Tribe and the United States government over the Dakota Access Pipeline (DAPL) has received national media attention. The Sioux Tribe claims that the United States Army Corps of Engineers' attempt to grant an easement across tribal land violates treaties between the United States and the Sioux Tribe, as well as the CWA and NEPA (Rome 2018). The United States

District Court of Columbia refused an injunction in this matter, but insisted that, as designated under NEPA, an environmental assessment be performed. According to Rome (2018) many NEPA requirements were satisfied, but that adequate consideration was not given to potential impacts on hunting and fishing. However, an Executive Order from President Trump granted the Corps' an easement in early 2017 (Rome 2018).

### **2.5.2 Region 2 Rocky Mountain Region – Colorado**

The Rocky Mountain Region is noted for its vast biodiversity and wide ranges in elevation. This region contains 11 National Forests (USFS 2017). The state selected for review in this region was Colorado. Colorado is a leader in both oil and natural gas reserves with 11 of the 100 largest gas fields in the United States. The state is responsible for producing approximately 4% of the United States crude oil (EIA 2018b). Between 2009 and 2012 approximately 13,000 well permits were issued during this time (Weible and Heikkila 2016). The state also has the 4<sup>th</sup> largest number of oil and gas wells in the United States. This however, has proven problematic because much of the oil and gas resources in the state are located in metropolitan areas, sparking citizen led controversies that have pushed for local bans on hydraulic fracturing (Minor 2014, Colorado Supreme Court 2016).

In Colorado, the Colorado Oil and Gas Conservation Commission is the agency in charge of oversight of oil and gas activity in the state and state laws have prevalence over municipal laws (Knight and Gullman 2015). The reasoning behind this is to promote efficiency. Oil and gas resources may be located under the jurisdiction of more than one municipality, a situation where it becomes more efficient to follow state laws rather than allowing each municipality dictate these decisions. This was evident in a case that was

brought to the Colorado Supreme Court in 2016 in *City of Longmont v. Colorado Oil and Gas Association* in which the Colorado Oil and Gas Association wanted the city's ban on hydraulic fracturing lifted because of a state law that grants the right to fair development of oil and gas (Colorado Supreme Court 2016). The court ruled in favor of the oil and gas association. Similar results occurred with fracking bans in Fort Collins and Boulder. Colorado has the home rule law, which allows for municipalities to pass laws that deal with municipal issues, but when these actions conflict with state law those laws have precedence (Mumby 2017).

In Colorado the state Supreme Court determined that state law, not local laws held precedence over past decisions that had banned hydraulic fracturing in some cities (Colorado Supreme Court 2016). Boulder, Fort Collins, and Longmont, had all implemented policies that limited hydraulic fracturing, but the Colorado Supreme Court ruling indicated that state law does not allow for such policies at the local level. According to the state's oil and gas association Colorado has very strict environmental policies that do an excellent job of protecting the environment while allowing for companies to access these resources. However, some citizen and environmental groups believe that air and water quality are being compromised (Wine 2016).

A tactic that Colorado has applied to manage the industry is requiring that oil and gas companies disclose the chemicals that they are using during the hydraulic fracturing process (Holahan and Arnold 2013). However, according to past research there are not any federal regulations requiring companies to disclose what chemicals that they are using in the hydraulic fracturing process (Maule et al. 2013); however, this information has been volunteered by some companies. Some states such as Colorado required this

disclosure as a state law (Maule et al. 2013). Other states have enacted laws to enforce disclosure at the state level and include: Arkansas, Montana, Ohio, Oklahoma, Pennsylvania, Texas, and Wyoming (Maule et al. 2013).

On federal land in Colorado, the USFS has both denied and allowed drilling to occur in the state. The USFS as previously mentioned manages the surface area of the nation's forests and must require environmental measures such as EISs to be developed in circumstances where an environmental impacts could occur. For example, in the Gunnison National Forest, drilling access was withdrawn because the NEPA process had not been followed as pointed out by the Western Environmental Law Center (Tisdell et al. 2015).

### **2.5.3 Region 3 Southwest Region – New Mexico**

The Southwestern Region only contains four states, but has 11 National Forests, and ranges from the desert areas at 1,300 feet elevation to 13,161 feet for Wheeler Peak (USFS 2018). The state selected in this region is New Mexico, the 6<sup>th</sup>-largest oil producing state and also in the top 10 for natural gas production (EIA 2018b). It also has large tribal lands that hold oil and natural gas resources. In New Mexico, the Oil and Gas Conservation Division is responsible for gathering well data, enforcing rules, and permitting wells.

New Mexico receives vast economic benefits from the oil and gas industry with approximately \$1.3 billion contributed to the state's general fund in 2011 (Ritchie 2014). One issue that New Mexico is dealing with however, is that of externalities. Externalities occur in an economy when a third party is bearing the costs or benefits of an action (Ritchie 2014). An example of this would be a stream used by local fisherman becoming

polluted by a new industry in the community. The pollution prevents anglers from being able to access the natural resource, fish. In New Mexico, there are externalities that exist when revenues from oil and gas extraction are collected in a county with production, but are then distributed to regions of the state that don't bear any of the costs of production such as truck traffic and potential environmental issues. In response, some communities have placed restrictions on hydraulic fracturing (Ritchie 2014). Mora County, New Mexico is one such community. The ban was eventually overturned in January 19, 2015 by the U.S. District Court of New Mexico (Ritchie 2014, Weidlich 2015, U.S. District Court 2015).

Another issue that has received media attention in New Mexico is the BLM's oil and gas leasing of land for drilling in the Chaco region. Controversy surrounds this action because the Chaco region also holds cultural resources in Chaco Canyon that belong to the USDI National Park Service. The National Park Service only has control over the land that is part of the Canyon; therefore, the BLM has the authority to make this decision for other public land within the Chaco region (Moe 2017). The debate centers on archeologists and the BLM. Archeologists want to protect other historical sites such as ancient roads that could be damaged by oil and gas drilling (Reese 2018). BLM spokespersons indicated that these resources would not have been discovered if not for the technological research required for oil and gas drilling in the area (Reese 2018). In April of 2018 a federal judge ruled in favor of the BLM indicating that the BLM had followed proper regulations (U.S. District Court New Mexico 2018). This ruling was appealed June 18, 2018.

#### **2.5.4 Region 4 Intermountain Region – Utah**

The Intermountain Region contains 13 National Forests and is expansive with approximately 34 million acres. The Region is very diverse in species, climate, and geography (USFS 2018). For the purpose of this discussion Utah was selected primarily because of its recent experiences in natural gas resource extraction. Utah saw the spike of the onshore shale boom as oil production tripled between 2003 and 2014. However, coal is still a leader in energy production in the state. Coal production has declined in the past 10 years while the energy from natural gas has increased approximately 20% (EIA 2017).

According to the Gretches-Wilkinson Center for Natural Resources, Energy, and the Environment, at the Colorado School of Law, the state of Utah has implemented multiple policies at the county and municipal levels to regulate oil and gas in their state. Utah allows for these entities to implement these laws if they don't contradict state laws. These laws are enacted to apply federal and state laws to zoning and permitting requirements, hauling routes, pipeline location and use, and water storage and disposal. One provision that applies to forest resources is in Millard County, where pipelines are limited in areas zoned as forest districts. State laws are primarily responsible for regulations on private lands (Sierra et al. 20175). The Utah Division of Oil Gas and Mining, a division of the Utah Department of Natural Resources, is the entity responsible for regulating oil and gas drilling and extraction in the state.

According to the state of Utah, oil and gas development and other energy-related activities account for over 60% of the Uintah Basin economy. Leasable land in Utah is divided into four primary groups, including federal, state, tribal, and private lands. Federal lands are regulated for oil and gas development by the BLM and the USFS, in accordance with federal law and in alignment with the regulation of federal lands in other

states. While the BLM regulates leasing for oil and gas development the USFS manages the surface area of over 8.2 million acres in the state. State land is regulated by the School & Institutional Trust Lands Administration; the Utah Division of Oil, Gas, and Mining; and Division of Forestry, Fire, and State Lands. Tribal lands are regulated by both the Bureau of Indian Affairs and BLM. Private land is regulated primarily by the Utah Division of Oil, Gas, and Mining.

Controversy regarding leasing for oil and gas development surrounds the BLM's leasing of mineral rights in the Uintah Basin. The Basin is in the northeastern corner of the state and has a history of ozone pollution. The Clean Air Act and NEPA, are applicable to this situation. While the BLM has leased these lands they still retain the right to oversee the activity and determine if drilling practices are adhering to federal regulations. Research has indicated that in the Uinta Basin is an area where more natural gas production could be entering the atmosphere than estimated by previous research (Sovacol 2014) potentially leading to air quality issues. A primary concern locally is whether or not the area can sustain their transportation infrastructure (Sierra et al 2015).

### **2.5.5 Region 5 Pacific Southwest – California**

The state of California encompasses the entire Pacific Southwest Region with 18 National Forests; a mostly hot, dry climate; and diverse species with over 600 fish and wildlife species (USFS 2018). The area contains 20 million acres within California. One major concern in this Region is the occurrence of wildfires because of the dense forest areas and increases in visitation (USFS 2018).

According the EIA, California is the third largest onshore petroleum producing state, with 18 refineries and a production capacity of 2 million barrels per day (EIA

2018b). The state also has one of the highest energy consumption rates in the U.S. However, it has diversified its energy resources with renewable energy such as solar and hydroelectric energy. In California, the Division of Oil, Gas, and Geothermal Resources is the agency responsible for regulating oil and gas activity.

In California oil and gas leasing and drilling occurs both on federal and privately held land. The BLM leases some of the largest oil producing regions in the United States with over 600 leases in production in California (BLM 2018). Much of this activity takes place in the San Joaquin Valley, which contains the San Joaquin River Gorge Recreation Area (BLM 2018). Some conflict has occurred in California regarding BLM leases. In February 2018, the Sierra Club sued the BLM because of the suspension of regulations that were intended to prevent natural gas waste (United States District Court 2018). Multiple instances have occurred in California where environmental activist groups have challenged either the BLM's decision to lease land for drilling, as well as whether or not the BLM is abiding by federal laws such as NEPA (Shannon 2014, Mumby 2017). The courts have had mixed rulings with the BLM being favored in some instances and environmental activists in others (Shannon 2014, Mumby 2017, U. S. District Court 2018). In a case between the National Audubon Society v. Superior Court, the California Supreme Court ruled in favor of the National Audubon Society to protect the water in Mono Lake. This was significant because the public trust doctrine can now potentially be used by local governments to allow fracking bans at the municipality level (Mumby 2017). These bans have been unsuccessful in many states because these municipal fracking bans conflicted with state laws which have held precedence (Fry et al. 2015, Knight and Gullman 2015).



Due to past activities on the part of the gas and oil industry, among others, the state has now determined that their public trust doctrine will now protect non-navigable fisheries waters. The public trust doctrine in modern applications is, according to Mumby (2017), a matter of state common law, and can be applied to protect water resources such as wetlands, recreational waters, groundwater, and drinking water, as well as water habitat (Mumby 2017). Glad you brought up public trust doctrine – give a brief explanation above of what the public trust doctrine is. In case readers aren't familiar with it. Also in California, in cases where there have been disputes between local bans of hydraulic fracturing, municipalities have been more successful than in some other states. California has a stronger home-rule authority than states such as Colorado, and rulings of municipalities in regard to zoning ordinances and regulating businesses within city limits are recognized (Mumby 2017)

California does have efforts in place to improve conservation efforts and improve management of the oil and gas industry. The California Department of Conservation has a Renewal Plan that is being implemented (California Department of Conservation 2018). This plan is intended to improve methods for both data management and overseeing regulations. Goals in the conservation plan include monitoring water use data, allowing the public more environmental information, evaluating all injection wells, improving skills of inspectors, and increasing fines for environmental violations (California Department of Conservation 2018).

California receives many economic benefits from oil and gas drilling onshore, both from BLM managed lands as well as from privately drilled wells (BLM 2017, EIA 2018b). The state's oil and gas industry according to the Los Angeles County Economic

Development Association (LAEDC), generates more than \$26.4 billion in state and local tax revenues and supports an estimated 368,100 jobs (LAEDC 2017). The state is working to balance these economic benefits that help their vast state with the desires of some of its citizen groups to exercise environmental protections.

### **2.5.6 Region 6 Pacific Northwest – Washington**

The Pacific Northwest is not a leader in oil and gas production. The Region has 19 National Forests, scenic areas, diverse habitats, and volcanic Monuments (USFS 2018). Washington is a leader in hydroelectric power and currently produces more energy that it consumes. The state is unique in that it is not an oil producing state, but it is a leader in oil refining capacity and gas storage reservoirs (EIA 2017). Currently, there are few oil and gas wells in Oregon and there is currently not any production in Washington.

### **2.5.7 Region 8 Southern Region – Texas**

The Southern Region stretches from Texas to Virginia, and includes Puerto Rico. It contains 13 states with environments that range from mountain areas to coastal regions (USFS 2018). The state selected was Texas due to its history in oil and gas onshore drilling. Texas is the leading oil producing state in the Southern Region and accounts for more than 25% of marketed natural gas being produced in the United States. Over one-third of the nation's crude oil is produced in Texas (EIA 2018b).

Texas is a state that has had disputes between federal and state government and between state and municipal governments (Rahm 2011, Weible and Heikkila 2016). These controversies have played out in the court system with success for both the federal and state government. The EPA has also had disputes with the Texas Railroad

Commission, and local-level multiple municipalities have conflicted with state policies that prohibit local governments from regulating the oil and gas industry.

The oil and gas industry is a strong contributor to the Texas economy and with the increase in shale gas production that economic contribution has risen with Texas containing five important shale gas plays (Rahm 2011). This success has not been without controversy. In Texas, the Railroad Commission is responsible for managing oil and gas resources while the Texas Commission on Environmental Quality (TCEQ) is responsible for monitoring water and air quality. According to Rahm (2011), Texas does not have a central entity that manages all oil and gas regulations. TCEQ has initiated legal disputes with the Environmental Protection Agency because of a state rule that allowed a Clean Air Act exemption to permit holders within the state. The EPA insisted that the TCEQ change this policy and the state of Texas refused. Texas also refused to create a state plan to implement federal regulations and sued the EPA (Rahm 2011).

The EPA has also had conflicts with the Texas Railroad Commission over the implementation of the Safe Drinking Water Act (Rahm 2011, Maule et al. 2013). EPA issued an endangerment order in the Barnett Shale area due to substances in drinking water. The Railroad Commission also has conflicted with municipalities, counties, and groundwater development boards, because these boards are required to create water management plans for their communities, but they don't hold any authority over the groundwater wanted for oil and gas well completion. This authority resides with the Railroad Commission (Rahm 2011). In Denton, Texas hydraulic fracturing was banned in 2014. This was done because of residents becoming frustrated with the process by which they were being represented (Lam 2018). Citizens did not feel that they were being

treated fairly by the administrative agencies that were responsible for meeting their needs. However, the Texas Legislature passed a bill, H.B. 40, which prevents cities from passing laws that interfere with hydraulic fracturing (Lam 2018). In Texas, and in many states, there are “home-rule cities, where the city can exercise authority for the best interests of its citizens in regard to health and safety.” According to Lam (2018), the Texas legislature passed this bill to limit home-rule city authority (Lam 2018).

In Texas it is clear that federalism is in action and, to be more specific, cooperative federalism due to the actions that have been taken by both the federal and state government to make decisions regarding the industry. The state has the authority to make decisions, and has exercised this authority, but the federal government has also stepped in and taken action when policies were not in compliance with federal laws. The question that is left to resolve however is at the smaller level of government, municipalities. A state government like Texas, similar to other state governments, was developed and has the level of power it has to better meet the needs of their citizens. With the number of disputes between municipalities and state governments that have favored the states, it must be determined whether or not state laws are representative of its citizens, or are those that are being impacted by what they consider negative externalities being forced to bear the costs of production when they do not feel they are receiving benefits. Or are the municipal disputes simply a case of misinformation and lobbying efforts of those that want a stronger federal authority when it comes to industry regulation?

### **2.5.8 Region 9 Eastern Region – Pennsylvania**

According to the USFS the Eastern Region is the most diverse area in the United States, because of its geographical, ecological, and social environment. In the case of Pennsylvania, it contains only one National Forest, the Allegheny National Forest, which is located in the foothills of the Appalachian Mountains. The Region houses over 15,000 miles of streams and 12 National Forests (USFS 2018). Pennsylvania is the second-largest natural gas producing state. It contains portions of the Marcellus and Utica Shales where production has increased rapidly since 2012 (EIA 2018). According to the EIA, the Appalachian regions is what has been leading U.S. growth in natural gas production since 2012.

This is a state that has a long history in mineral extractions, but the state has now set an energy standard that 18% of their electricity must come from renewable resources by 2021 (EIA 2018b). In Pennsylvania, the Pennsylvania Bureau of Oil and Gas Management is responsible for overseeing that oil and gas resources extracted safely and that natural resources in the state are protected. This agency handles permitting, development of regulations, and industry training. Pennsylvania is not new to the oil and gas industry. According to the American Chemical Society, the first oil well was drilled in Titusville, Pennsylvania.

Natural gas production growth has led to debates in this USFS Region as policy makers seek to balance rapid growth of the industry with its abundant natural resources. Forest fragmentation is an issue with relevance to oil and gas development in Pennsylvania (Drohan et al. 2012). Increases in drilling in Pennsylvania, by using hydraulic fracturing to extract natural gas, has led to many questions regarding management and impacts of the practice on Pennsylvania forest land. Concerns about

forest fragmentation include habitat disruption, loss of recreational areas, and loss of biodiversity. The process is being used in the state on both public and private land (Davis and Robinson 2012, Drohan et al. 2012, Smith and Ferguson 2013, Theodori et al. 2014).

Pennsylvania has been subject to disputes between state and municipal government regarding oil and gas drilling processes, particularly hydraulic fracturing. In 1984, Pennsylvania passed the Gas Act, which is an overarching law that superseded all local ordinances with the exception of the Municipal Planning Code and Flood Plain Code (Wagstaff 2013). This Act was designed to provide for the health and safety of entities such as the environment, personal property, oil and gas facilities, and the state's natural resources. The Municipal Planning Code does allow municipalities some power to regulate hydraulic fracturing if regulations are not striving to meet the same needs as the Gas Act. For example, in the case of *Huntley & Huntley v. Borough Council of Oakmont*, the city of Oakmont was able to pass regulations regarding the location of drilling because of a historical preservation ordinance (Wagstaff 2013).

Another conflict in Pennsylvania was between the USFS and the mineral rights holders of land within the Allegheny National Forest (Diaz 2013). The case was *Minard Run Oil Co. v. U.S. Forest Service*, and took place because the USFS was taking action to apply regulations required by NEPA. The Western District, U. S. Court of Pennsylvania ruled in favor of Minard Run, and caused the USFS to lift its moratorium on drilling. This decision was appealed, but upheld by the Third Circuit Court (Diaz 2013). This case was unique because forest land in the Allegheny National Forest was purchased under the Weeks Act 1911, which allowed the Secretary of Agriculture to purchase surface land, but leave mineral ownership with current owners. In Pennsylvania, mineral rights

supersede surface rights, which allowed for mineral owners to gain access to their minerals (Diaz 2013). Today, the Allegheny National Forest is open for drilling.

### **2.5.9 Region 10 Alaska Region – Alaska**

Alaska is the only state in Region 10. It has long been one of the top oil and gas producing states in the Nation (EIA 2018b). The state is dependent on their pipeline system and rail lines to transport oil and gas resources, due to their climate and rural environment. Many towns in the state depend on petroleum for heating, and on the oil and gas industry to support their economy (Busenberg 2011).

Alaska is abundant in natural resources. The state is home to two National Forests, the Tongass National Forest, and Chugach National Forest, which are the largest National Forests in the U.S. (USFS 2018). In Alaska, the Alaska Oil and Gas Conservation Commission is in charge of developing Alaska's oil and gas resources while maintaining environmental quality of the state's abundant natural resources. The Alaska Department of Natural Resources Division of Oil & Gas (ADOG) manages Alaska's land for oil, gas, and geothermal exploration. The Oil and Gas Conservation Commission (AOGCC) was established by the Alaska Oil and Gas Conservation Act of 1955 (AOGCC 2018). It is the agency that oversees preventing waste, protecting mineral owners, settling disputes, and inspecting operations (AOGCC 2018)

Alaska has two primary federally owned areas that conduct oil and gas leasing. They are the Cook Inlet Region and the National Petroleum Reserve (NPR, BLM 2018). The National Petroleum Reserve covers over 22 million acres on the Alaskan North Slope and was designated as an emergency oil reserve for the Navy in 1976 (BLM 2018). Now the BLM conducts lease sales for land in this area. Production takes place in the

Cook Inlet Region, but the NPR has yet to have any sustainable oil and gas production. Alaska benefits from these regions because it receives 90% of leasing revenues from the Cook Region and 50% from the National Petroleum Reserve (BLM 2018). In Alaska residents are eligible for annual dividend payments from the state's oil revenues (Hsieh 2003). This is made possible through Alaska's Permanent Fund, which was established in 1982. The fund consists of money earned from the state's oil royalties, approximately 25% of which are contributed to the fund. Residents then receive an annual dividend payment from these dollars. According to Hsieh (2003) payments have ranged from approximately \$331 to \$1,964 per person.

Conflicts occur in Alaska over drilling in the NPR, the Trans-Alaska Pipeline, and drilling in the Arctic. These conflicts have occurred because of disagreements between political parties; arguments among special interest groups between the importance of economic development versus environmental protection; and whether or not the federal agencies are acting appropriately when making decisions regarding leasing, drilling, or reclamation (O'Dell 1986, Marks 2009, Busenberg 2011, Woods 2013). Disputes have also arisen about taxation, tribal lands, and whether or not local residents are receiving appropriate benefits (Anderson 2002, Ahn 2010). In Alaska, residents have voiced concern over not receiving enough economic benefits from the industry due to their oil production tax being changed to a net production tax in 2013 (Macmillan 2018). They have also disputed the federal government's decision making regarding tribal lands and many think these decisions should be left to tribal governments not the federal government (Ahn 2010).



Recently, a conflict occurred between the Alaska Oil and Gas Association and the Center for Biological Diversity and a federal law, the Endangered Species Act, was implemented to settle the dispute (United States Court of Appeals 2018). In February, 2018, the U.S. Court of Appeals, Ninth Circuit, ruled that the “*Pusa Hispida*” commonly known as ringed seals could be listed as threatened under the Endangered Species Act (United States Court of Appeals 2018). This ruling can limit or prohibit drilling in ringed seal habitat in the Arctic, because under the Endangered Species Act habitat of a species that is threatened or endangered can be protected (Gaffhey 2007, Robbins 2013, Pendery et al. 2018).

## **2.6 Discussion**

Conflicts exist between divisions of government regarding oil and gas policy in most of the USFS Regions as policy makers work to meet the needs of opposing interests, stakeholders, and constituents. Struggles exist between municipal and state governments regarding zoning and limits on drilling and fracking that have occurred in Regions 2, 3, 5, 8, and 9. In Region 5 (California) and Region 9 (Pennsylvania), municipal decisions to limit or regulate the industry were upheld in court allowing local interests to be recognized. In Regions 2 (Colorado), 3 (New Mexico), and Region 8 (Texas) state laws that supported drilling were favored and municipal laws were limited or prohibited if they conflicted with state laws. Overall, most decision authority is given to state laws unless these laws are found to be in conflict with federal laws. In Region 9 (Pennsylvania), where most conflicts were between municipal and state governments, the primary federal conflict found was due to mineral rights disputes of private citizens that owned mineral

rights to federal land. The conflict occurred because mineral holders desired to gain access to these resources and lease these rights.

In Region 1 (North Dakota) and Region 4 (Utah) conflicts over decision making authority existed between the federal and state government and between federal and tribal governments. All Regions have seen conflict in cases where the federal government has had to exercise authority by either enforcing environmental standards, exercising leasing authority, or monitoring current federal leases for environmental standards. Examples include EPA enforcing environmental standards in Texas, and BLM exercising their authority to lease federal lands and monitor the drilling activities on those leased lands. Region 10 (Alaska) has primarily seen disputes regarding citizen groups and the federal government concerning environmental issues such as endangered species (e.g., the ringed seals). Disputes have also occurred regarding tribal lands when the federal government has made decisions regarding tribal lands in Alaska and North Dakota.

The state that has seen the greatest number of both disputes between municipal and state governments and between state government and the federal government is Texas. Each case involved an incident when either a municipal government or the federal government attempted to ban drilling activities or enforce federal environmental policies. In Texas, the state holds the authority to regulate the industry unless federal laws and standards are being violated. In these instances the EPA has held the final regulatory authority.

The one overwhelming result, common across all USFS Regions, is the case of externalities. Disputes between divisions of government have occurred when one group or another believes that the costs they are paying are not equitable to the benefits that

they are receiving from drilling. This is the case when municipalities have attempted to ban hydraulic fracturing because they feel they are paying either an environmental cost or a monetary cost such as road damage or loss of water resources for drilling to take place. The same can be said for instances when drilling has been halted in a region due to the existence of an endangered species in the drilling region. This occurs when a group of citizens wish to protect this species and its habitat for the future. These groups feel that the endangerment of this species is too high of a cost for the economic benefits of drilling in that particular region. Other disputes that occurred over mineral rights, or distribution of revenues or economic benefits, are additional examples of one group believing that they are not receiving adequate benefits to compensate for costs.

Due to these conflicts it is extremely important that two actions occur. One is for the continuation of federalism and a balance of power regarding oil and gas decision making. This is important to prevent on level of from having too much authority and control over regulating the industry. If one entity gained too much power they could be at risk to be controlled by one interest group or another. The other is a need for continuous research and education to determine and disseminate best management practices for exploration, development and extraction of oil and gas. Education and communication with stakeholder groups is vital to sustainable development of energy resources. This is vital to sustainability because information can improve decision making as well as allow for multiple stakeholders or interest groups to have their needs met such as preserving resources, providing a stable affordable energy supply, protecting the environment, and promoting economic resiliency.

Balancing energy resources with environmental protections is a difficult, but necessary task. This is the case with almost any policy decision. Policies are often ambiguous, allowing for various interpretation in each situation. Energy, like agriculture or most industries, will always impact the environment in some manner. The key is sustainability. Sustainability in natural resources refers to being able to utilize resources without diminishing them so that future generations can take advantage of these resources. The balance of power between divisions of government in the United States functions in a manner that prevents one entity from having sole authority and exists to allow control of decision making at the state and municipal level. This is occurring with the regulation and management oil and gas on federal, state, and municipal land. The states clearly have the most decision making authority, but in some instances municipal governments have succeeded in achieving decision making authority regarding limits on drilling activity. The federal government has also exercised final authority if state laws are violating federal environmental laws. This continued balance of power is important if all stakeholders are to continue to have the opportunity to exercise their opinions and values regarding natural resources and both their utilization and preservation.

There is often a lack of understanding between stakeholder groups such as the energy industry and general community members. This must be remedied to encourage policy development that is effective. Laws such as the Multiple-Use Sustained Yield Act and the Clean Water Act are good examples of policies that can be used to balance the use of resources and various wishes of the public. However, disputes that are taking place between, federal, state, and municipal leaders, as well as between the BLM and environmental groups, indicates that there is a lack of agreement or understanding

between stakeholders and policy makers. The balance of power between divisions of government serves as a system of checks and balances allowing states to take the lead in regulation. Many USFS Regions, are seeing a balance of power in decision making, but methods of reaching these decisions resulting in multiple court battles is a costly process for all parties involved.

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## CHAPTER III

### MISSISSIPPI LANDOWNER PERCEPTIONS OF OIL AND GAS DEVELOPMENT

#### Executive Summary

Oil and gas development on forest land is a widely debated topic in social, political, economic development, and natural resource circles worldwide. To gain insight into the forest landowner's perspective on this topic, a public perception study of landowner views in the Tuscaloosa Marine Shale Formation (TMS) was conducted by the Mississippi State University's Forest and Wildlife Research Center and Mississippi State University Extension Service. The TMS is an emerging shale play primarily in southwest Mississippi and Central Louisiana. Primary concerns of respondents included, protecting water quality, environmental protection, preserving property to pass on to future generations, managing infrastructure, economic returns for the local area, and receiving fair treatment in the leasing and property restoration process. It was learned that respondents were very supportive of policies that would focus on a balance between developing oil and gas resources with environmental protection of the region. It is recommended that the industry provide more transparency and communication with property owners, policy makers, and the general public.

#### 3.1 Introduction

A public perception study of rural landowners in southwest Mississippi, an emerging shale play, demonstrated a desire to achieve a balance between economic

enhancement and environmental disruption in future development of the Tuscaloosa Marine Shale Formation. The study was implemented in response to a need for empirical data on landowners' views in the area of oil and gas exploration and development. Results presented were intended to assist policy makers in both the public and private sectors in decision making.

### **3.1.1 Background**

The world is experiencing a global shale boom because of advances in technologies in regard to the hydraulic fracturing process and horizontal drilling practices (Weber 2012, Merrill and Schizer 2013, Munasib and Rickman 2015). Both processes are used to extract oil and gas from shale. "Shale is a fine-grained, sedimentary rock composed of mud from flakes of clay minerals and tiny fragments (silt-sized particles) of other materials (EIA 2018)." The shale acts as both the source and reservoir for natural gas according to the Environmental Protection Agency (EPA) "Hydraulic fracturing is a well stimulation process used to maximize the extraction of underground resources including oil, natural gas, geothermal energy, and even water (EPA 2014)." Advances to another drilling process, horizontal drilling, has also contributed to increases in drilling in new shale plays. Hydraulic fracturing according to the (EIA 2018) follows a process involving drilling a well vertically to a certain depth and subsequently bending the drilling path until it extends horizontally. These technologies have influenced the financial feasibility of drilling for oil and gas in long unutilized shale plays (EIA 2018). The term hydraulic fracturing is of particular interest due to the level of controversial information surrounding the term found in popular media sources. Hydraulic fracturing or

“fracking,” has been viewed in mainstream and social media as a negative term associated with negative environmental repercussions. There is a great deal of misinformation and a lack of easy access to understand more credible information about this process which has led to some debates as to whether or not oil and gas drilling is safe and whether the risks are worth the benefits from development.

This research builds on prior studies of both public perceptions of unconventional resource development (i.e., onshore oil and gas drilling), land use decision making, and natural resource utilization. Numerous studies have been conducted on the public opinion and social impacts of oil and gas drilling in the United States (Anderson and Theodori 2009, Brasier et al. 2011, Filteau 2011, Theodori et al. 2014). However, little research has been conducted on the forest landowner perspectives. This perspective is important because this stakeholder group can potentially directly bear the costs and receive the benefits of the industry. Prior studies on social impacts revealed that perceived negative impacts were associated with quality of life issues such as increased truck traffic, potential groundwater contamination, air quality issues, and safety hazards such as leaks or explosions (Anderson and Theodori 2009, Theodori 2009, Brasier et al. 2011, Ellis et al. 2016). Benefits acknowledged by both residents and elected officials were associated with economic improvements such as increased tax revenues, job creation, retail trade improvements, infrastructure improvements to schools, and energy security (Anderson and Theodori 2009, Filteau, 2011, Paredes et al. 2015, Kreuze et al. 2016).

The next question is what is influencing perceptions of the industry. Prior studies of both oil and gas drilling perceptions and natural resource policy indicate that the public is influenced by factors such as ideology, knowledge, personal needs and experiences,

proximity to drilling, and group affiliations (Brulle et al. 2012, Gilbert et al. 2013, Theodori et al. 2014, Choma et al. 2016, Ellis et al. 2016). This research examined factors such as political ideology, industry affiliation, knowledge, and experiences with drilling and how these factors have influenced landowner views of hydraulic fracturing and policy preferences in regard to industry regulations. Past research has been conducted on what influences landowner decision making and policy perception in regard to hunting leases, energy development, and participation in conservation programs. This study builds upon these prior studies by applying a similar methodology and landowner values such as reasons for land ownership, political ideology, and views on the importance of environmental regulation versus economic benefits of drilling. In most instances concerning natural resource decision making there are tradeoffs that must be evaluated (Mehmood 2010, Fish 2011, Butler et al. 2012, Jacquet 2012, Brenne 2013, Adams et al. 2014). Factors such as economic benefits and/or environmental costs and who is receiving these benefits and/or paying the costs can impact perceptions of these tradeoffs as well as landowner decision making (Cubbage and Newman 2006, Adams et al. 2014, Sovacool 2014, Knight 2015).

### **3.2 Methodology**

A mail survey was developed, modeled after surveys used to evaluate the public perceptions of the oil and gas industry in Texas and Pennsylvania (Theodori and Luloff, 2015). The survey was adapted to address landowner views rather than general community views as in prior research. The survey was then pilot-tested by administering it to Mississippi State University County Extension Agents, with positions in counties within the Tuscaloosa Marine Shale. The survey was also reviewed by industry and legal



professionals to validate technical terminology. A mail survey was sent in May, 2015, to 1,200 forest landowners in six of the Mississippi counties within the Tuscaloosa Marine Shale play. All questions and research procedures were approved by the MSU Institutional Review Board's Committee for the Protection of Human Subjects (Docket No.15-007). The study counties were all in Mississippi and included Amite, Adams, Franklin, Lincoln, Pike, and Wilkinson. Each of the six counties contains a portion of the Tuscaloosa Marine Shale, and each have seen increases in drilling activity since 2011. Of note, drilling in the region has slowed extensively during 2016 and 2017 due to lower oil and gas prices worldwide. Two mail-outs were issued, resulting in 152 and 132 completed surveys for the first and second phases, respectively, with an overall response rate of 25.4% after adjusting for non-deliverables. This is lower than previous studies of Mississippi landowners (Munn et al. 2007). However, these past studies focused on topics such as hunting and fishing versus oil and gas drilling. Oil and gas drilling activity is still low in Mississippi and may have contributed to lesser number of responses. There was not a study of this nature to use as a reference for the response rate.

Landowners selected for this study had to own more than 10 acres of forest land in the projected play. Participants were selected by using the forest landowner list currently held within the College of Forest Resources at Mississippi State University. Survey distribution started with a list whereby the 25<sup>th</sup> landowner in each county, and every 25<sup>th</sup> landowner afterward, was selected until the sample size of 1,200 had been reached over the six counties. A cover letter explaining the project was included in each survey packet, along with return postage. The response rate data was compiled into an Excel spreadsheet and analyzed using basic statistical analysis. The data was also input to Statistical Package

for Social Sciences (SPSS) software (SPSS 2016). The data was analyzed with an empirical model developed to examine what influenced landowner decision making in regard to participation oil and gas leasing. The methodology was modeled after similar studies in land use policy and choice modeling, using binary regression analysis (Conway 2003, Shivan 2010, Ma 2012, Wuensch 2014).

The research question was “What variables influenced landowner decision making with regards to agreeing to participate in an oil and gas lease?” The question allowed for a yes or no response with yes = 1 and no = 0. Since the dependent variable contained only 2 possible answers the analysis used was a binary logistic regression (Wuensch 2014). The regression model was used to predict the likelihood of landowners choosing to participate in a lease or choosing not to participate. The variable  $\hat{Y}$  is the predicted probability of choosing to lease and  $1-\hat{Y}$  is the predicted probability of choosing not to lease:

$$\ln(ODDS) = \ln \left( \frac{\hat{Y}}{1-\hat{Y}} \right) = a + b \times \quad (3.1)$$

The analysis was conducted using the following steps:

Step 1 A frequency analysis was conducted to reveal any patterns in the variables.

Step 2 A cross tabulation analysis with a Chi Square was conducted to determine significance.

Step 3 A correlation analysis was selected as part of the cross tabulation analysis and was conducted to show positive and negative relationships between the variables.

Step 4 A binary logistic regression analysis was conducted with only the variables that showed a significant Chi Square result.

Step 5 A second binary logistic regression analysis was conducted with only variables that contained a significant  $p$  value of less than 0.05.

Variables analyzed included mineral rights ownership, reasons for landownership, importance of oil and gas drilling benefits such as energy security, economic development, tax revenues, job creation, and concerns about oil and gas drilling such as road safety, traffic congestion, and hydraulic fracturing.

To maximize the likelihood that the prediction in this study is accurate, a variety of techniques were used to eliminate the confounding variables that created redundancy or overlap. The binary logistic regression was run with independent variables being categorical variables, using the indicator option. The response with the lowest value being the reference category. The lowest value in this analysis was selected by respondents when the issue was not important to them or that the individual did not belong to an affiliated group. After the initial binary logistic regression was run, all variables that had an insignificant result were deleted from the model. The model was then run with only significant variables. This was done to show more clearly which variables were influencing landowner leasing decisions.

Next, an additional binary logistic regression analysis was used in this model. The same variables were used, but they were run as continuous independent variables to account for variables being ordinal. This analysis was conducted to determine if there was a significant difference between the results and allow for a comparison of responses within a variable. Insignificant variables were deleted from the model and it was run again with only the remaining variables.

The second research question was, “Do forest landowners believe that decision makers should place a higher priority on policies that protect the environment, policies that promote economic development, or should they place equal priority on both types of

policies regarding oil and gas development on forest land?” This question was used to determine how forest landowners viewed tradeoffs between environmental protection and economic benefits associated with the industry. The data was analyzed using the following steps:

Step 1 A frequency analysis was conducted to show any patterns in the data.

Step 2 A cross tabulation analysis with a Chi Square was conducted to show relationships between the variables and to determine significance.

Step 3 A multinomial logistic regression analysis was conducted with only the variables that showed a significant Chi Square result.

The multinomial regression analysis produced few significant results because respondents overwhelmingly believed that equal priority should be placed on policies protecting the environment and those improving the economy. This caused most variables to be removed from the model, with the exceptions of landowners concerned about pipeline maintenance who were less likely to place a priority on policies impacting the economy and landowners receiving mineral royalties who were less likely to place a priority on the environment. However, these variables showed little influence and the resounding result is that forest landowners believe that there should be equal priority between oil and gas policies protecting the environment and those improving the economy.

### **3.3 Results**

#### **3.3.1 Descriptive Statistics**

It is important to note some socio-demographic characteristics of survey respondents to better understand the survey population. Survey respondents were primarily male (77%) with education and income levels that were fairly evenly distributed.

According to the USDA Forest Service nationwide forest landowners are primarily male (Butler 2008). Fifty-nine percent of respondents had household incomes earning less than \$105,000, and 21% less than \$45,000. Within the 41% of the respondents with a household income of over \$105,000, 19% were over \$185,000. Income levels of the survey respondents were higher than forest landowners from a prior Mississippi landowner based study in 2007 in which respondents indicated that only 41% earned more than \$60,000 (Munn et al. 2007).

Respondents were primarily conservative and Republican with 53% reporting they are conservative and 70% reporting they are Republican. Age of survey respondents was approximately 70 years old and average length of residency in Mississippi was 41 years. Respondents were older than Mississippi forest landowners in previous studies in which the average age was 50 (Munn et al. 2007). Nationwide 49% of forest landowners have reached retirement age (Butler 2008). In summary, respondents appear to have a vested interest in the local community and economy with a strong desire to be able to pass their land down to future generations as previously discussed.

Respondents were also asked to identify any groups, oil and gas or otherwise, in which they were involved. Responses were, for the most part, local and statewide agriculture- and forestry-related organizations. The largest number of respondents belonged to the Cattlemen's Association which indicates that this would be a likely outlet for information dissemination to member landowners. Most survey respondents have completed some level of formal education. The education level with the highest number of responses was a bachelor's degree with 26% saying they had completed this level of education. A point of interest is that over 80% of the survey respondents had taken some

coursework at the college level, and 46% of respondents had completed either a bachelor's or graduate degree. Interestingly, most respondents (73%) have either a family member, close friend, or neighbor who is employed by the oil and gas industry. This is a high participation rate, showing that the southwestern portion of the state has a major involvement with the oil and gas industry.

### **3.3.2 Respondents Receiving Information**

Respondents were asked if they were informed about policies in regard to oil and gas development. Sixty-nine percent said they were not informed or knowledgeable about policies regarding oil and gas development. Twenty-nine percent said they felt knowledgeable about these policies. Overall, respondents said they received most of their information from the oil and gas industry or from friends and family. This was not surprising, considering that more than 70% of respondents have a close friend, neighbor, or family member employed by the oil and gas industry.

### **3.3.3 Importance of Potential Positive Impacts**

Respondents were asked about the relative importance of potential positive impacts from oil and gas development. Using a scale of 1 to 10, with 10 being the highest level of importance, the highest priority was given to improved U.S. energy security. This was closely followed by job creation for local residents and increased local tax revenues. These preferences were in line with prior public opinion research on the subject that has indicated that the public, in the early stages of development, were supportive of the potential to create jobs and improve energy security, especially in areas that struggle economically (Wynveen 2011, Tunstall 2015, Boudet et al. 2016).

### 3.3.4 Landowner Concerns

In addition to measuring attitudes toward the positive aspects of oil and gas development, the study also sought to investigate concerns landowners had about such activity. The major concern landowners had about oil and gas development was its potential effects on water quality. Over 77% of respondents ranked water quality as being very important, with only 7% saying it was unimportant (Figure 3.1).

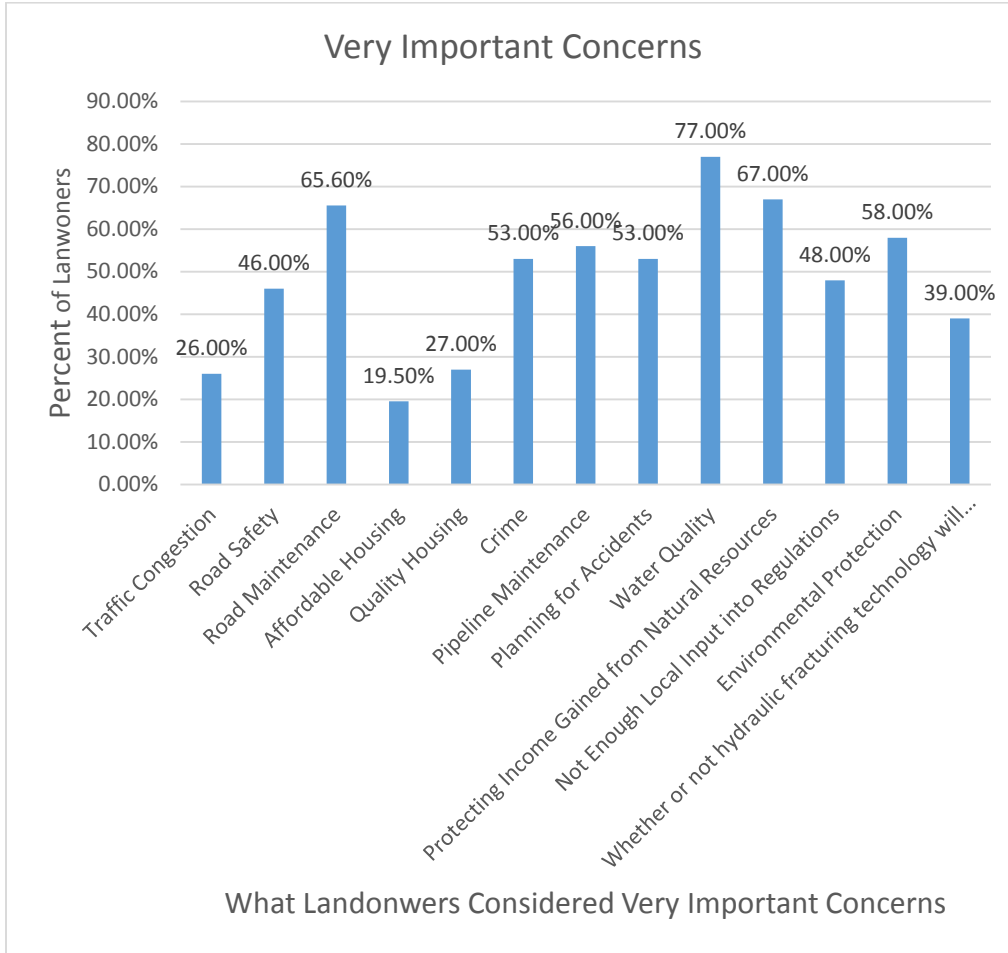


Figure 3.1 Percent of surveyed landowner respondents ranking concerns as very important.

Respondents were least concerned about traffic congestion and affordable housing, but most concerned about water quality, road maintenance, environmental protection, and protecting income gained from natural resources (i.e., timber harvesting, hunting, and other recreation). This is similar to results from other regions, such as Pennsylvania in the Marcellus Shale region (Filteau 2011, Eaton 2013, Paredes et al. 2015).



### 3.3.5 Landownership

Landowners were asked about the size of their land parcels, type of land, land usage, reasons for landownership, and mineral rights. Survey respondents owned a total of 80,010 acres of forest land, with their average tract size being 580 acres. Respondents who owned tracts that measured from 51 to 150 acres comprised the largest group, around 35% of those surveyed. About 25% held small acreages (less than 50 acres), and about 20% owned between 150 and 500 acres. Owners of large tracts (500 acres or more) constituted a little more than 10% of those surveyed. Acreage contained in the various parcels was also reviewed by county. In Pike County, landowners primarily owned less than 150 acres while landownership in Amite County was split closely among those with less than 50 acres (30%), between 50 and 150 acres (25%), and 150 and 500 acres (23%).

Respondents who also owned mineral rights indicated they owned a total of 70,409 acres of forest land with the average acreage amounting to 319 acres. Respondents who indicated they did not own mineral rights accounted approximately 9,601 acres with average tract size being 208 acres. Accordingly, approximately 88% of the land accounted for in this survey has the landowner owning both mineral and surface rights. More information is needed to determine the precise portions of mineral interests landowners hold. This is because a percentage of a mineral interest or all mineral interest in a tract of land can be sold. The survey did not ask what percentage of mineral interest landowners own. The survey only asked if the landowners owned the mineral rights to their property.

### 3.3.6 Reasons for Land Ownership

Landowners were asked to classify their land according to its use. The primary response was that 61% of the land owned by respondents was forest land, 29% agricultural and forest (mixed), and 10% agricultural land.

Landowners were also asked to rate the level of importance among the various reasons they had for owning land. The ability to pass land down to their heirs ranked as the single most important reason they held their land. Second in importance was that the land was the respondent's primary residence. Furthermore, the holding of land for economic reasons (as an investment or for timber production) was frequently cited, as was landownership for aesthetic or recreational reasons (i.e., beauty or scenery, hunting, wildlife habitat, non-hunting recreation). Note that many landowners chose more than one priority for owning their land (Figure 3.2).

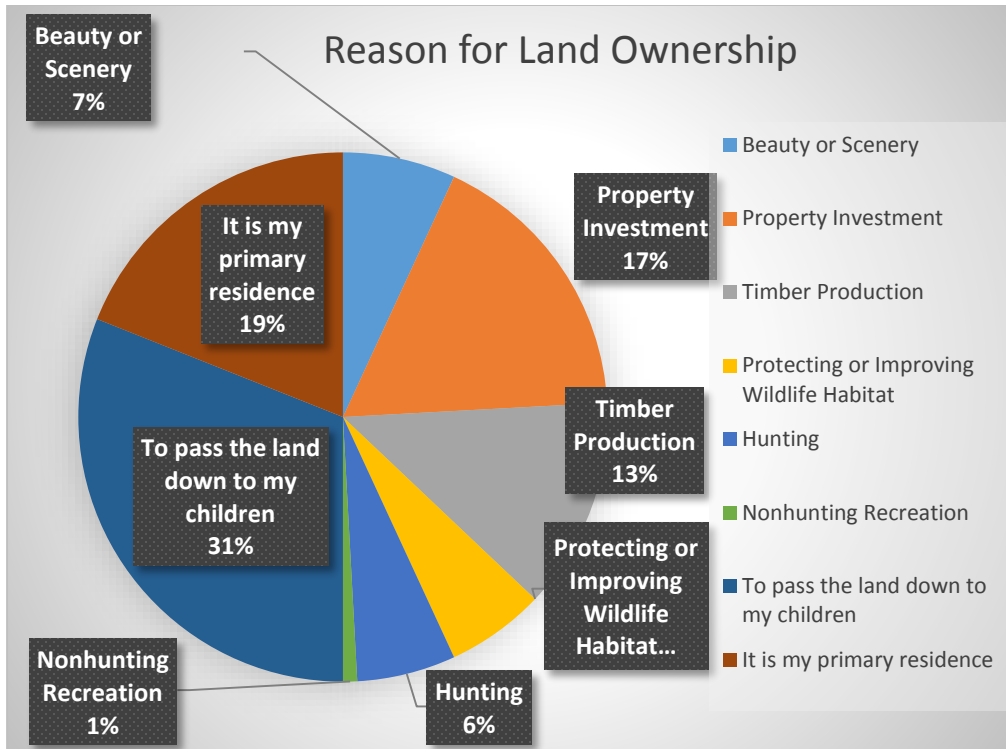


Figure 3.2 Reasons that landowners owned their land.

### 3.3.7 Leasing

Respondents were asked if they had been approached to lease their land for oil and/or gas drilling and, if so, did they agree to participate in a lease. Sixty-three percent said they had been asked to lease, and 37% said they had not. Out of those respondents who had been asked to participate in an oil and gas lease, approximately 51% agreed to do so. Overall, 32% of respondents agreed to a lease.

The income levels of landowners were analyzed to see if present income had an effect on a landowner's willingness to lease. Landowners with lower income levels were more likely to agree to an oil and gas lease if approached. Of those earning over \$185,000 per year only 10% agreed to lease. In addition to income, tract sizes owned by willing lessors were compared to parcels of those who did not lease. Those with larger tracts of 150 acres or more were most likely to lease.

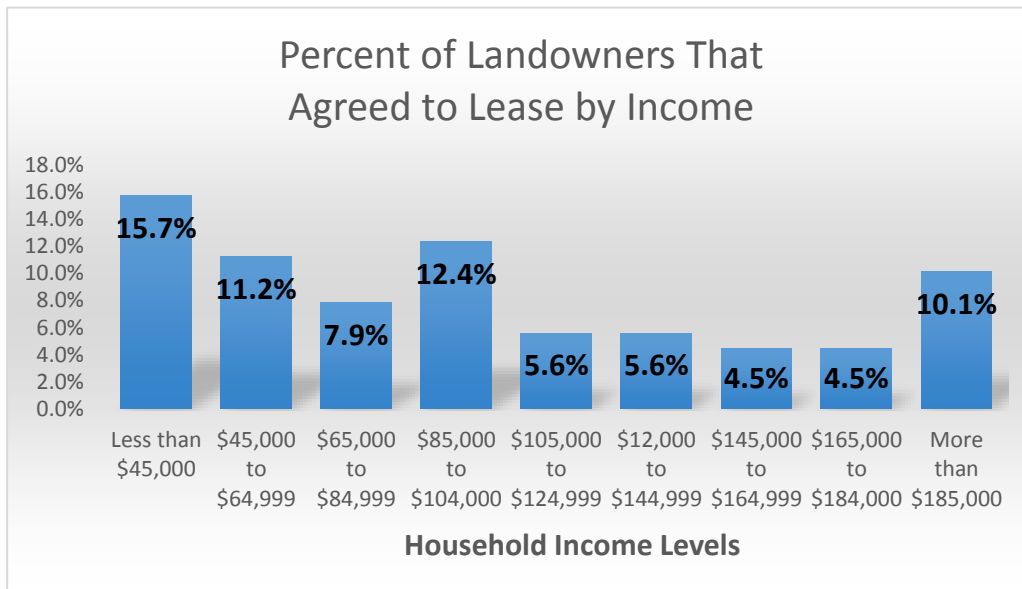


Figure 3.3 Income levels of surveyed landowner respondents and whether or not they agreed to an oil and gas lease.

More than 80% of landowners who ranked residency, timber production, and having the ability to pass land down to future generations as very important agreed to lease their property. Only 71% of those who ranked hunting as a very important reason for owning their land and agreed to an oil and gas lease (Figure3.4) conflicts with their intended land use – something to discuss

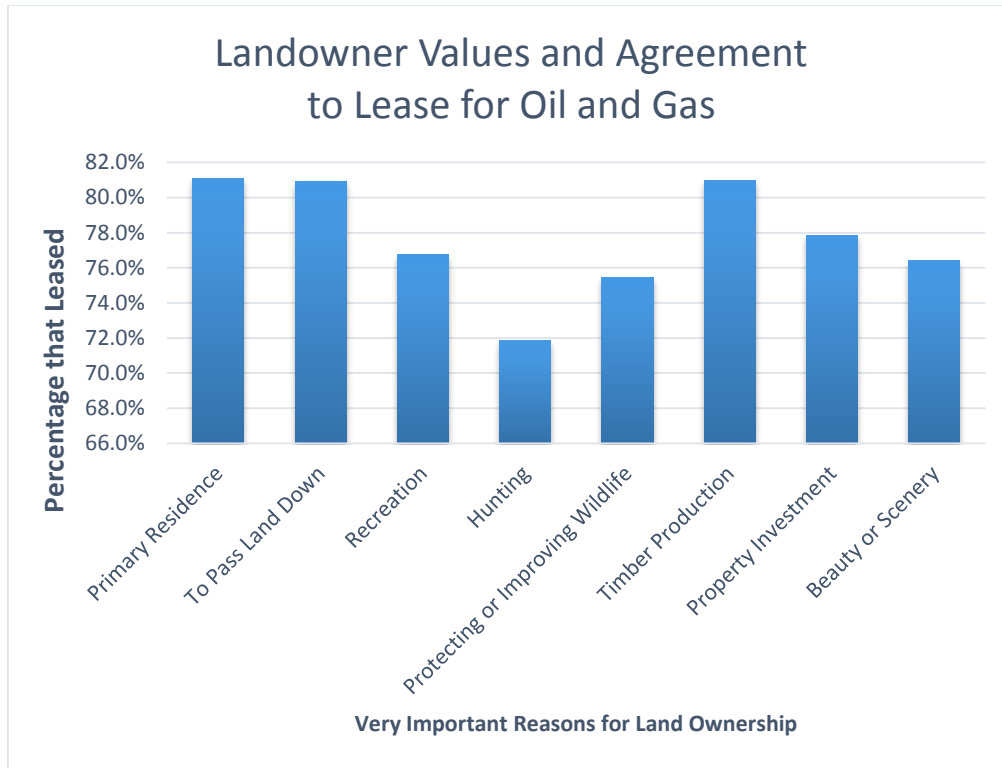


Figure 3.4 Relationship between surveyed landowner respondents who agreed to an oil and gas lease and their reasons for owning land.

### 3.4 Correlation Analyses and Regression Analyses

The correlation analysis, which was conducted as part of the first model, indicated that there was a positive correlation between agreements to a lease and education, mineral rights ownership, and primary landownership. Correlations were negative between leasing decisions and acreage size and gross income. Significant correlations existed between timber production, passing land down to future generations, and the importance of energy security (Table 3.1). A negative correlation existed between concerns about traffic congestion and agreement to lease, meaning that those concerned about traffic congestion in their community were less likely to lease. It was important to note that

during the time of the survey residents in the selected counties were already experiencing some increases in traffic due to drilling activity.

Table 3.1 Correlation Results of Landowner Leasing Decisions and landowner Values and Concerns

Did you agree to a lease?	Pearson Correlation	Sig. (2-tailed)	N
Own land primarily for timber production	0.175*	0.017058057	186
Own land to pass down to children	0.205**	0.004990267	186
Very Concerned about traffic congestion	-0.174*	0.017824623	186
Improved U.S. energy security is very important	0.225**	0.002032146	186

### 3.5 Binary Logistics Regression

#### 3.5.1 Trade-offs in Energy Development

An examination of energy development on forest and agricultural lands invariably focuses on necessary trade-offs in the following areas: (1) economic and energy security, (2) future land-use values, (3) deforestation, (4) preservation of biological diversity, (5) accessibility, (6) employment, (7) environmental protection, and (8) damage and restoration (Theodori et al. 2009, Cohen et al. 2011, Jacquet and Stedman 2011, Hoel and Sletten 2016).

Forest landowners were asked if decision makers in oil and gas development should: (1) place a higher priority on protecting the environment, (2) place a higher priority on enhancing the economy, or (3) consider the economy and the environment to be of equal importance. The response of 63% of respondents was that the economy and environment are equally important and should be treated as such (Figure 3.5).

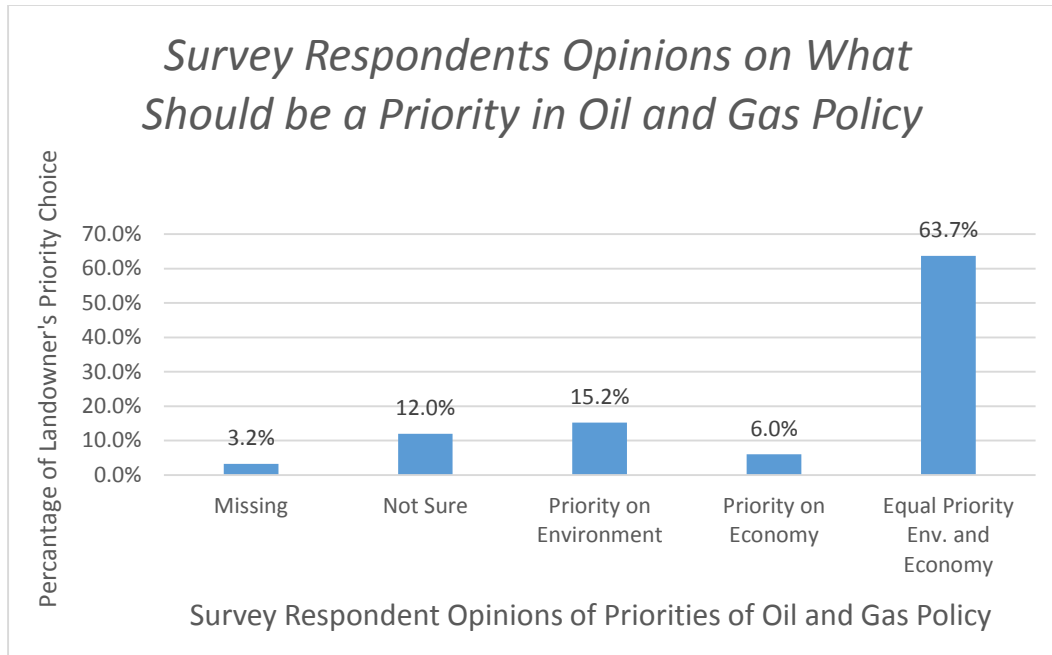


Figure 3.5 Survey respondent opinions of priorities of oil and gas policy.

As expected, results of the binary logistic regression indicated that mineral rights ownership influenced leasing decisions. Landowners that owned mineral rights were over 26 times more likely to engage in a lease (Table 3.2).

Another important indicator of leasing decisions was reasons for landownership. Landowners that indicated timber production was somewhat important or very important were 4.1 to 4.8 times more likely to participate in an oil and gas lease than those that thought timber production was unimportant. An additional significant result was that landowners very concerned about traffic congestion indicated they would not participate in an oil and gas lease. When referring back to the descriptive statistics it was evident that this was a small percentage of respondents, but important because among this group's fear of traffic congestion was an important indicator of landowners declining to participate in oil and gas leasing (Table 3.2).

Table 3.2 Binary Logistic Regression Results - Leasing Decisions

<b>Did you agree to an oil and gas lease?</b>	B	S.E.	Wald	df	Sig.	Exp(B)
<b>Do you own any mineral rights? (1=Yes)</b>	3.267	0.828	15.591	1	0.000	26.243
<b>Timber production</b>			7.313	2	0.026	
<b>Landowners that felt timber production was somewhat important.</b>	1.419	0.684	4.305	1	0.038	4.132
<b>Landowners that felt timber production was very important.</b>	1.584	0.590	7.204	1	0.007	4.876
<b>Traffic congestion</b>			15.402	2	0.000	
<b>Landowners that felt traffic congestions was somewhat important.</b>	1.731	0.711	5.926	1	0.015	5.645
<b>Landowners that felt traffic congestion was very important.</b>	-1.071	0.476	5.054	1	0.025	0.343
<b>Constant</b>	-4.170	1.579	6.977	1	0.008	0.015

Another interesting result is the influence of the use of hydraulic fracturing.

Landowners were asked about their level of concern in regard to the use of hydraulic fracturing. Those landowners very concerned about hydraulic fracturing were 0.5 times less likely to participate in an oil and gas lease than those that were not concerned about this technology (Table 3.3). This result however, did not have a significant *p* value when analyzing this with binary logistic regression. Therefore, this result was deleted from the model, but can be viewed in (Table 3.3).



Table 3.3 Binary Logistic Regression Result of Influence of Concerns Regarding Hydraulic Fracturing on Leasing Decisions

<b>Did you agree to an oil and gas lease?</b>	B	S.E.	Wald	df	Sig.	Exp(B)
<b>Whether or not hydraulic fracturing technology will be used</b>			0.909	2	0.635	
<b>9.14 Whether or not hydraulic fracturing technology will be used</b>	-0.111	0.709	0.024	1	0.876	0.895
<b>9.14 Whether or not hydraulic fracturing technology will be used</b>	-0.586	0.674	0.756	1	0.385	0.556

### 3.6 Binary Logistics Regression with Continuous Variables

When running the binary logistic regression with continuous variables the results were slightly different (Table 3.4). Mineral rights ownership is still a strong predictor of lease participation. The importance of timber production and passing land down to future generations also increased the likelihood of engaging in an oil and gas lease. When running the regression with a continuous variable, timber production was no longer significant. Another difference was that if landowners believed job creation for local residents was important then landowners were more likely to participate in a lease. This model indicated that while road safety concerns were not likely to prevent landowners from leasing, hydraulic fracturing concerns could potentially deter them (Table 3.4).

Table 3.4 Binary Logistic Regression - Leasing Decisions - Analysis 2

<b>Did you agree to an oil and gas lease?</b>		B	S.E.	Wald	df	Sig.	Exp (B)
	Do you own any mineral rights?(1)	2.496	0.658	14.406	1	0.000	12.129
	Timber production	0.373	0.279	1.780	1	0.182	1.452
	Traffic congestion	-0.783	0.341	5.275	1	0.022	0.457
	Whether or not hydraulic fracturing technology will be used	-0.473	0.289	2.685	1	0.101	0.623
	Job creation for local residents	1.263	0.461	7.503	1	0.006	3.537
	To pass the land down to my children	0.648	0.332	3.820	1	0.051	1.912
	Road safety	0.910	0.365	6.219	1	0.013	2.485
	Constant	-4.809	1.252	14.753	1	0.000	0.008

### 3.7 Discussion

Certain commonalities of oil and gas development were of particular concern to landowners surveyed in this study. In some cases, the extent of landowner concern could cause them to decline to lease. Respondents were asked for their opinion on the following aspects of oil and gas development: (1) hydraulic fracturing, (2) pooling of their minerals with those of other landowners, and (3) locating drill sites on their land. While more than

40% of respondents indicated that they would not want to decline to lease if hydraulic fracturing would be used, approximately 20% said it would prevent them from leasing. The survey drew similar responses to pooling and siting of the well head. More than 40% indicated that pooling and/or drilling on their land would not deter leasing, but more than 20% said that it would.

With 63% of responding landowners indicating they feel the economy and environment are equally important when making decisions in regard to oil and gas policies, it is important that policy makers and the industry recognize the importance of best practices, environmental protection, transparency, and clear communication strategies when evaluating oil and gas development planning. It is also important that decision makers be aware that current land-use decisions and reasons for landownership influence how landowners view policies and their participation in oil and gas leasing. Landowners who own their land for personal or aesthetic reasons, such as hunting and fishing and beauty or scenery were less likely to participate in an oil and gas lease than those who owned their property for monetary reasons.

Study participants indicated the primary reason for owning their land was to pass this property down to future generations. This information, coupled with the desire for a balance between economic returns and environmental protection, can lead to the conclusion that participants feel strongly about the need to protect their property both for investment needs and to protect the land for future generations.

Respondents did not feel they were knowledgeable about the policies in regard to development even though many have close ties to the industry. They feel the process could be improved with more information, communication, and better plans for restoration. It is

important that industry and policy makers be aware that all of the recommendations for improvement that received the highest responses are related in some way to the area of leasing and mineral rights. According to these study results, there are improvements needed in the leasing process. It is recommended that additional training for landowners, landmen (persons responsible for negotiating contracts for obtaining minerals), policy makers, and attorneys be provided to those serving this region. This can be done by providing continuing education courses for landmen and attorneys in cooperation with their respective organizations. These courses should include information on landowner concerns, best management practices in regard to environmental standards, and leases that are mutually beneficial to the industry and mineral owners. Policy makers should be informed of policies that balance industry growth with natural resource management. Special topics should include water protection, new technologies, tax policies, economic returns, emergency management, and infrastructure management. Training should be designed so that it is accessible to various stakeholder groups and facilitates constructive conversation and relationships between industry, landowners, policy makers, and general public. This is the key to any sustainable positive development in a community.

### **3.8 Future research**

Public perception studies have been previously conducted in states such as Texas and Pennsylvania to determine residents' and elected officials' perceptions of the oil and gas industry (Anderson and Theodori, 2009, Theodori et al. 2014; Willits et al. 2016). Information from this study adds to the research by determining the perceptions of landowners and improvements that should be made in regard to practices. It is recommended that more research be done on the perceptions of policy makers in the region

to determine what types of information they need to develop policies that can balance the growth of the industry with environmental preservation of water, forest, and other natural resources. Similar research should also be conducted in other regions for two primary purposes. To prepare states across the country with emerging shale plays for eventual increases in oil and gas development and to determine if perceptions remain the same across socio-demographic difference, and stages of development.

The Tuscaloosa Marine Shale is an emerging shale play and is still in the early stages of development. It would be beneficial to all stakeholders to conduct landowner perception research in regions where oil and gas drilling activity is in a more advanced stage of development to determine if there are differences in perceived benefits and concerns. This would be beneficial in developing better practices in regions where oil and gas drilling is not yet at full capacity.

This study provided essential information regarding the development of oil and gas industry, but more research is required to enable policy makers to make informed decisions on appropriate policies that will impact a diverse citizenry in the future. For example, similar work should be conducted in areas where there are different socio-economic dynamics. In the TMS, many landowners had relatively high household income levels, high levels of education, and close ties to the oil and gas industry. Respondents were also primarily conservative and Republican in their beliefs and owned their property for its long-term benefits. Conducting this type of study in areas where political beliefs are more varied and income levels and reasons for landownership are different could produce different results. This study revealed no significant results based on political party affiliation, but this theory should be further explored in an area where party

affiliation and ideology are different to determine if these variables are influential regarding leasing decisions and oil and gas policy perception.

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CHAPTER IV  
POOLING AND UNITIZATION, APPLYING THE POLICY PROCESS TO OIL AND  
GAS MINERAL RIGHTS

**4.1 Introduction**

Public policymaking is an ever evolving process whereby problems must be addressed as policymakers are challenged with finding timely solutions. Often policy solutions, in turn, can cause unforeseen results and policies must be made to address these circumstances as well. It is difficult for policies to be adapted in a timely fashion to address all problems and circumstances. For this reason, policies are often vague and left to a multitude of interpretations (Stone 1997).

These occurrences can be seen in the evolution of oil and gas development and in policies created to manage the industry in the United States. Policies that were put in place have had some unforeseen results. The recent rapid industry growth has caused conflicts over policies that do not always exactly fit with the advancing technology and changes in the industry. As a result, this study focused on policies and the history regarding pooling and unitization of oil and gas interests in the United States. Pooling and unitization are very similar and often used interchangeably although there are differences between the two terms. Pooling is a process that can be used to bring together land parcels into a single drilling unit to be used for oil and gas production with an

emphasis on well spacing (Flanery and Morgan 2011, Warren 2014). Unitization involves the combining of mineral interests of land containing a common pool or source of oil or gas and is based on drilling efficiency and conservation (Flanery and Morgan 2011). The policy making process surrounding the decision making from its inception following the beginning of oil and gas extraction to its implications in today's shale boom, exemplify the need for ever changing and adapting policies to meet societal needs.

## **4.2 Problem Formation - Situational Analysis**

Until energy prices plummeted in 2015, oil and gas development had been increasing at a rapid pace in the United States. These rapid increases were due to many factors, but advances in technology, which has improved efficiency and reduced drilling costs, along with rising energy prices, were touted as primary reasons for this growth (Phillips 2013, Koplos et al. 2014). With increases in drilling, land not previously used for energy production has begun to be explored for oil and gas resources (Perry 2012, Koplos et al. 2014, Munasib and Rickman 2015). Much of this land had been utilized in other ways such as for timber production, agriculture, and recreation.

### **4.2.1 Oil and Gas Production**

Oil and gas drilling has occurred both onshore and offshore in the United States, but according to the Energy Information Administration (EIA) onshore production has been increasing in the last decade (EIA 2018). One of the primary reasons that production began to increase onshore in the U.S. was due to improvements in technologies such as hydraulic fracturing and horizontal drilling. These changes, coupled with rising energy prices, made drilling in nontraditional shale plays more economically feasible (Koplos et al. 2014). They were not new technologies, but improvements in these areas has contributed to their widespread use.

According to the Environmental Protection Agency (EPA) hydraulic fracturing is a technique used to stimulate wells to increase the amount of oil and gas resources the well can extract (EPA 2018). According to the EIA, horizontal drilling or directional drilling occurs when a well is inserted vertically then shifts horizontally at some point below the surface (EIA 2018). One advantage is that you most likely will have one well

head, versus multiple drill sites without this horizontal movement. These technological advancements have contributed to multiple policy issues that have resulted due to these changes in the extraction process. Policy issues now impacting private landowners included leasing and mineral rights, environmental versus economic tradeoffs, and land use decision making (Eaton 2013, Blank 2014, Sovacool 2014, Reid 2016).

In Texas, it was evident that policies could not be adapted fast enough to address issues arising due to these new technologies. As a result, old laws were being applied to entirely new concepts. Horizontal drilling was challenging the legal system and the Texas Railroad Commission, the latter of which is the agency in the state that regulates oil and gas development (Holliday 2013). This fell in line with the theory that policies need to be vague and fluid but timely rather than specific for them to be more useful as circumstances change (Stone 1997). One natural resource strategy that has been adapted over time to manage oil and gas drilling is the use of pooling.

#### **4.2.2 Policy Agenda - Pooling and Unitization**

A policy topic, which has risen to the forefront of discussions regarding onshore oil and gas growth, is leasing practices and mineral rights. Mineral rights ownership issues have been contested regarding both public and private land across the United States (Pendery 2010, Blank 2014, Bopp 2014, Truslow 2016). The topic becomes much more complicated when mineral rights and surface rights are severed, which means that surface rights for a piece of property and rights to the minerals the property contains can be sold as two separate entities or properties.

Horizontal drilling is used more frequently now than in the past resulting in the need for access to more land for a well than for its vertical counterparts (Powers 2011,

Koplos, et al. 2014). This has created concerns about fair leasing for landowners and economic and environmental decisions in regard to well spacing and drilling activity (Bopp 2014). One debated topic is the process of pooling and/or unitization. To fully understand these concepts it is important to know the history and definitions of pooling and unitization. According to the Oil & Gas Law Report, pooling refers to the combining of multiple tracts of land into one drilling unit for the purpose of acquiring a drilling permit for production (Wright 2012). There is voluntary pooling and there is forced or compulsory pooling. “Compulsory pooling refers to the use of the state police power to combine separately-owned interests within a designated spacing and/or drilling unit (Kramer 2007).” Unitization is the process of combining leases or royalty interests to create a larger operation. This process as well can be voluntary or mandatory. Decisions on how these two processes are implemented is determined by state laws (Kramer 2007, Wright 2012).

### **4.3 Methodology**

This study uses Anderson’s Policy Process Model (Anderson et al. 1984) which was adapted and reported on in Cubbage et al.’s *Forest Resource Policy* (1993). The model is used to examine the creation, adoption, and implementation of pooling and unitization to solve natural resource issues (Cubbage et al. 1993 The Policy Process Model entails: 1) problem formation, 2) policy agenda, 3) policy implementation, and 4) evaluation. Each step has been followed in the process of developing policies to manage oil and gas leasing, drilling, and balancing utilization these resources.

This study also uses theories developed by Stone (1997) that explain the use of the policy process as a tool to solve natural resource problems and evaluate tradeoffs.

This study focuses primarily on reviewing the history of pooling and unitization in sample states containing unconventional resource plays, why these policies have been developed, how they impact landowners and the industry, and how these policies have been adapted to meet challenges created by the U.S. shale boom. The states that were covered each contain a resource play at varying levels of development and include Texas, Pennsylvania, and Mississippi. The study will focus on the Eagle Ford Shale (Texas), Marcellus Shale (Pennsylvania), and the Tuscaloosa Marine Shale (Mississippi). A literature review was conducted in regard to each of these states and by reviewing cases and briefs found in the Westlaw database (Westlaw 2018). A historical literature review of the development of pooling and unitization policies was conducted as well as a summarization of current pooling and unitization policies for each sample state.

Policies surrounding pooling and unitization have been examined to determine whether or not compulsory pooling exists in each state, who determines the pool size, and whether there are positive or negative benefits to landowners participating in a pool. The two-fold process included reviewing each state's oil and gas management website and then reviewing for each state's pooling and unitization history, policies, and conflicts that have arisen surrounding these issues.

Also, a landowner perception study was conducted by the Mississippi State University Forest and Wildlife Research Center and the Mississippi State University Extension Service to determine views on pooling and other practices commonly associated with the drilling process. A binary logistic regression analysis was conducted to determine if any of these practices would potentially prevent a landowner from participating in oil and gas leases on their property. Landowners were asked if they had

chosen to participate in an oil and gas lease. This answer was used as the dependent variable. Landowners were asked if any of the listed drilling practices would cause them to change their mind about participating in an oil and gas lease. Their responses were to be No = 0, Maybe = 1, and Yes = 2. Ensuing data were analyzed as continuous independent variables using the Statistical Package for Social Sciences (SPSS 2016) software package. This analysis protocol was used because the responses were ordinal and this allowed for taking into account the weight of the Maybe and Yes responses in comparison to No responses. The analysis was also conducted with the independent variables being categorized as categorical variables to identify any differences. The independent variables were used to predict the dependent variable. By analyzing independent variables as continuous, weights would be considered and prediction could be maximized based on the independent variable with the most impact. Independent variables were also analyzed after being categorized as categorical in SPSS so that the independent variable with the most impact could be identified.

### **Policy Formation - History of Pooling and Unitization**

Pooling is due in part to a Supreme Court of Pennsylvania decision in 1889, *Westmoreland & Cambria Natural Gas Co. v. De Witt.*, which produced the “rule of capture” (Flanery and Morgan 2011). In this decision oil and gas resources were compared to wild animals roaming from property to property. It cited that similarly oil and gas also migrate, although this is beneath the land surface. Therefore, a landowner may not own the oil underneath their land if it moves from property to property and is captured by another landowner. The resource is then owned by the landowner that



captured it and that owner is not liable to other adjacent landowners (Flanery and Morgan 2011).

The U. S. Supreme Court supported this decision in *Brown v. Spilman*, and ruled that if an adjoining landowner drills a well and gains control of the oil under another's land it becomes their property. This occurred when a well drains the oil or gas from reserves that were originally located under the property of adjacent landowners (Flanery and Morgan 2011). This is an example of a rule being created to influence behavior (Stone 1997). In the public policy process, policy instruments were used to create solutions to problems. Policy instruments took the form of rules and inducements according to Stone. These policy solutions can give the impression that they can or will permanently fix a problem, when in reality the solutions must constantly be adapted to meet changing societal needs; therefore, the policy-making process was continuous.

This can be seen in the evolution of oil and gas policies that had to be changed and adapted to meet societal needs (Wiseman 2009, Davis and Charles 2012, Minor 2014). The rule of capture was created to determine ownership of fluid resources that were different than resources such as coal or trees, which were very fixed (Flanery and Morgan 2011, Wiseman 2015). Again, oil and gas resources were treated conceptually like wild animals that are hunted and can move freely from one property to the next.

Court decisions based on the rule of capture had some unintended results. Since this was a free market situation it created a desire for landowners to drill multiple wells as quickly as possible to try and secure as much oil or gas from the common pool as possible. The result was frequent over-drilling, waste, increased environmental costs, and loss of potential economic benefits (e.g., lower prices due to oversupply) (Flanery and

Morgan 2011). Over-drilling and conflicts over well spacing spread across multiple states. This was an unforeseen circumstance that resulted from the rule created by policy-makers to address one social problem, but in turn created the need for additional rules to address these new problems. For example, problems arose in Texas where massive over drilling occurred in a rush for mineral owners to gain access to oil that could be obtained before the resources were drained by their neighbors (Flanery and Morgan 2011).

### **Policy Adoption - Response – Development of Pooling and Unitization Policies**

In response to over drilling many states began to implement conservation strategies to offset the unintended result of the rule of capture's application to oil and gas regulation. The first of these conservation strategies were policies on well spacing that were put in place to reduce and/or limit the number of wells that could be drilled on a specified number of acres (Flanery and Morgan 2011, Holahan and Arnold 2013). This in time led to the practice of pooling tracts of land together into a single drilling unit. This was done for production decisions to be made and to prevent a single landowner from capturing the economic benefits from oil or gas that could migrate from one property to another. In Mississippi, 40 acres of spacing is required for shallow oil wells, a 80 to 160 acre spacing for deep oil wells, and a 160 to 640 acre spacing for gas wells depending on depth (Isonhood et al. 2013). It should be pointed out that spacing regulations vary from state to state (Williams and Myers 1957, Libecap and Smith 2001, Kramer 2007, Bopp 2014).

According to Flannery and Morgan (2011), both voluntary and compulsory pooling were used. Voluntary pooling occurs when tracts of land owned by different parties were joined together in a lease or when leases were written so that pooling will be

allowed with nearby properties. Compulsory pooling, or what is also called statutory pooling, occurs when land that was required to be in a tract or drilling unit because of spacing requirements was not included or not owned by the same landowner (Kramer 2007). Many states offer a provision when land in need of a completed drilling unit was owned by multiple landowners, which allows drilling operators to request that the needed property be included in the pool. These types of orders can require non-consenting landowner mineral interests to be pooled with those already joined together (Kramer 2007, Holahan and Arnold 2013).

Pooling has become a more prevalent issue because of two factors: 1) since pooling was originally created, horizontal drilling has become widespread in oil and gas extraction and 2) a horizontal well may cross property boundaries and then in turn, because of increases in extraction efficiency, can drain oil and gas from further distances causing one well to capture resources under adjacent landowner properties. Due to this, multiple states have continued to apply pooling and unitization rules and regulations. In Texas, pooling has been used to join together smaller tracts of land to accommodate the amount of acreage needed for drilling horizontal wells (Squib 2013). It was important to note that in Texas, pooling was primarily voluntary not compulsory (Blackwell 2010, Warren 2014).

The history and reasoning behind pooling and unitization indicates that it was instituted to improve fairness, efficiency, and environmental management, but the literature also indicated that there are problems and conflicts over policies (Williams and Meyers 1957, Flanery and Morgan 2011). In a Pennsylvania study, landowners unsatisfied with their current leases indicated that they had signed their leases because of

pressure from neighbors or pressure from gas companies that told them they could take their gas whether they signed leases or not (Ward et al. 2010). There is a difference between pooling and unitization, although sometimes the terms are used interchangeably. While pooling is used to follow regulations about well spacing, unitization is concerned with the supply and improving efficiency. Unitization is often voluntary in most states (Lavoy and Seidl 2013).

#### **4.4 Policy Implementation and Evaluation**

Based on the history regarding pooling and unitization, and some of the circumstances surrounding pooling, it was important to address the implementation of pooling strategies in states with unconventional resource plays. Pooling was first used as a tool for conventional resource plays as a means to improve fairness, conservation, and efficiency (Trachtenberg 2012). However, with the varying dynamics of unconventional resource development, questions have arisen as how best to implement these strategies.

In any policy decision there are trade-offs. Sometimes these trade-offs are an attempt to balance efficiency and equality (Stone 1997). Pooling and unitization is an example of this occurring in policy development and landowner decision making. Policies were created to make oil and gas drilling more efficient and make the process fairer to adjoining landowners. Prior to pooling it was difficult for adjacent landowners with small and large tracts to receive fair returns for their oil and gas resources. Pooling was created to increase fairness and access resources in a more efficient, conservative manner (Trachtenberg 2012). However, some feel the process was not favorable to landowners and those that do not desire to participate in drilling or bear any of the costs

have expressed that they are not being treated fairly (Bopp 2014). This illustrates trade-offs between efficiency and equality.

According to the Buffalo Law Journal (2011-2012), the reason some landowners decided to participate in an oil and gas lease is because they believe that courts favor oil and gas companies in disputes and, due to pooling laws, they may be forced to lease their land anyway (Trachtenberg 2012). Trachtenberg, made the point that there is a power asymmetry because landowners do not have anything to gain if they choose not to participate in a lease. This is because if their neighbors decide to lease they could be force pooled into a lease, and they would also be in proximity to impacts from drilling on adjacent land. This was an example of an equality trade-off as discussed in Fish (2011). The history and reasoning behind pooling and unitization indicated that it was instituted to improve fairness, efficiency, and environmental management, but various studies also indicated that, historically, there were problems and conflicts over these policies (Libecap and Wiggins 1985, Fish 2011, Flanery and Morgan 2011, Trachtenberg 2012, Bopp 2014).

#### **4.5 Parcelization**

Another contributing factor to increases in awareness of pooling was the occurrence of parcelization. According to Mehmood and Zhang (2001) parcelization, which was a shift from few landowners with large amounts of land to many landowners with smaller tracts, has been steadily increasing in the United States. Causes of parcelization include death in which land is passed to others, in many cases where heirs do not want to own and manage the land, and taxation policies, in which the taxes are more than can be recouped through land appreciation (Stone and Tyrrell 2012).

Parcelization is also caused when the economy of an area improves. This enables more people to be able to afford land, but it also may result in land development. For example, forested areas were, and still are, being converted to residential areas and commercial development in the United States at a rapid rate (Mehmood and Zhang 2001, Kilgore and Snyder 2016).

As more people own smaller tracts of land in a potential unit it is possible that there could be increasing instances where pooling is petitioned and mandated. In a 2015 report, the Interstate Oil and Gas Commission (IOGCC) indicated that there is the potential for issues or conflicts in many states such as North Dakota, Texas, Alabama, Alaska, Colorado, Illinois, Indiana, Kansas, Kentucky, Nevada, New Mexico, New York, Ohio, Oklahoma, and Utah, regarding pooling requirements, unitizations rules, well completion timelines, and number of wells allowed in units (IOGCC 2015). In 2004, according to the Texas A&M School of Law, the Interstate Oil and Gas Compact Commission created a Model Act (Warren 2014). The 2004 Model Act was created to offer states an option for a regulatory strategy to conserve oil and gas resources (IOGCC 2004, Warren 2014). The additional purpose was to create an avenue for states to have similar laws to regulate drilling units and pooling. As most oil and gas regulation was left up to the states, laws varied from state to state. However, according to Texas A&M School of Law many states have used the 2004 Model Act as a guide (IOGCC 2004, Warren 2014).

## **4.6 Key State Overviews within Resource Plays**

### **4.6.1 Pennsylvania**

A 2010 study in Pennsylvania in Bradford and Tioga Counties surveyed landowner experiences with oil and gas leasing. The study revealed that 52% believed that drilling activity had impacted them positively. However, in response to another question, 55% of those that had chosen to participate in an oil or gas lease would not have agreed to their original lease if they now had the choice. These landowners believed that they did not receive enough of a monetary compensation or that they would have sought legal counsel before agreeing to lease. Landowners unsatisfied with their leases said they had agreed to leases because of pressure from their neighbors (Ward et al. 2010). According to the authors landowners had more concerns about their leases than about drilling on their property or in their community.

Pennsylvania's oil and gas history reaches back to 1859 with the drilling of the "Drake Well" in Titusville, Pennsylvania. The state has now become a leader in natural gas production, known for its Marcellus Shale as its unconventional resource supply (Bopp 2014). In Pennsylvania, the Pennsylvania Bureau of Oil and Gas Management is the agency responsible for oil and gas regulation. The state has seen controversy over forced pooling and mineral rights. Concerns in regard to fairness in leasing practices and royalty payments resulted in the amendment of the 1961 Oil and Gas Lease Act. The amended Oil and Gas Lease Act of 2013, enabled mineral rights owners to have more transparency in regard to royalties. However, the Act also allowed for operators to institute forced pooling in the case of horizontal drilling unless landowners had taken action to prohibit the practice (Bopp 2014). The problem, according to Bopp, was that

many oil and gas leases were created years ago, prior to the use of horizontal drilling in the state. Therefore, it would be impossible for horizontal drilling to have been prohibited specifically in these leases. The question now is whether or not this Act will be applied retroactively (Bopp 2014). In Pennsylvania, the conflict goes even further. The constitutionality of pooling has come into question because laws written in regard to pooling were created before horizontal drilling and hydraulic fracturing were practiced and current laws would create a default forced pooling clause for landowners (Blank 2014, Bopp 2014).

#### **4.6.2 Texas**

The Texas Railroad Commission has been the regulatory body for oil and gas development in Texas. Problems have arisen surrounding oil and gas regulation because technology has changed faster than laws regulating them (Wiseman 2009, Rahm 2011, Burney 2014, Golden and Wiseman 2015, Blackwell et al. 2018,). This has brought about the question of whether or not property rights are being properly protected. Texas is different from other states in the management of pooling. Most states allow for compulsory pooling but Texas, to protect property rights, has legislation in place to allow for voluntary pooling initiated by the mineral interest owners rather than operators or the Texas Railroad Commission (Warren 2014, Blackwell et al. 2018).

In Texas, most pooling is voluntary and designed to prevent unnecessary wells as designed. There are two major requirements for pooling in the state. The lessee can exercise his/her right to pooling, but must do this “in strict accordance with the lease language” and the lessee must “act in good faith” (Warren 2014). This implies that pooling of resources cannot violate any lease conditions or be conducted in a manner that



would not normally be conducted by an operator acting in the best interest of both parties (Warren 2014).

Texas also has compulsory or forced pooling which has not been as powerful as in other states as the Mineral Interest Pooling Act of 1965 (MIPA) was weak in compulsory pooling power. This Act requires that voluntary pooling be attempted first, and only applies to reservoirs discovered after 1961. MIPA was designed to help small landowners and encouraged voluntary pooling versus forced pooling (Blackwell et al. 2018). MIPA however, did not dictate to the Texas Railroad Commission how to determine the fair amount of proceeds a smaller mineral holder should receive.

#### **4.6.3 Mississippi**

Pooling and unitization have become somewhat controversial in some states for a variety of reasons. In Mississippi, conflicts have arisen because non-consenting landowners have expressed that they do not desire to participate in leasing, but feel that they have been forced to do so. In Mississippi, the State Oil and Gas Board can designate what land can be included in a drilling unit. This has led to some landowners in Mississippi, to express concerns about fair treatment. Typical statements were “I think what’s going on is terrible, she said,” or “We worked all our lives for this land. Now we have no rights. We’re seeing it degraded, and we feel like we are being taken advantage of.” (Vicory 2014).

The Mississippi State University Extension Service and Forest and Wildlife Research Center have been engaged in educational programming to aid landowners and policy-makers in decision making in regard to oil and gas development. During this process it was discovered that more information was needed in this area. Landowners and

policy-makers had concerns and questions about leasing practices, mineral rights versus surface rights, taxation, infrastructure funding, environmental protection, and safety of new technologies (Carter and Gordon 2014). In response to this, a public perception study was conducted in regard to forest landowner views on the oil and gas industry and its regulatory policies. Landowners were asked how they felt about new technologies such as hydraulic fracturing and leasing practices. One finding indicated that landowners wanted improvements to leasing practices and more information about the process. Among the significant findings, landowners indicated that having their property pooled with another property would be 1.67 times more likely to change their mind about participating in an oil and gas lease if their property would be pooled with another. If an oil and gas company would require the use of water on the property it would also discourage leasing by 1.85 times. Not significant, was the fact that landowners indicated that other drilling activities such as building a road, oil well location, use of hydraulic fracturing, and creation of a storage pond would not be as likely to discourage them from leasing.

Table 4.1 Potential impact on landowner leasing decisions based on oil and gas drilling conditions and leasing requirements.

If you agreed to an oil and gas lease, would any of the following conditions cause you to change your decision?						
	B	S.E.	Wald	df	Sig.	Exp(B)
Your property is pooled with properties of other owners.	0.51	0.26	3.88	1.00	0.05	1.67
The oil well would be located on your property.	-0.11	0.38	0.08	1.00	0.78	0.90
A road will need to be built on your property.	-0.38	0.35	1.13	1.00	0.29	0.69
A pond containing wastewater created during the drilling process will be located on your property.	-0.33	0.32	1.05	1.00	0.31	0.72
A personal well for drinking water is located on your property.	-0.21	0.24	0.77	1.00	0.38	0.81
The oil/gas company would require the use of water located on your property.	0.61	0.31	3.86	1.00	0.05	1.85
Hydraulic fracturing technology would be used on your property.	-0.10	0.26	0.16	1.00	0.69	0.90
Constant	1.32	0.20	43.82	1.00	0.00	3.74

#### 4.7 Discussion

Pooling and unitization was first implemented to resolve issues surrounding the rule of capture. Pooling and unitization was used to create a system of fairness in the resource extraction process so that one landowner did not drain oil and gas resources from another's property and adjacent landowners would be able to receive some of the monetary benefits or some level of security. However, to gain this security landowner's

lose some ability to make decisions about their property. This situation is a clear tradeoff between their freedom of choice concerning their land use and security.

Due to conflicts that are now being voiced surrounding pooling and unitization when landowners do not want to give up this freedom, more human dimension related research should be conducted on how landowners value energy security versus the having the choice of being able to maintain decision making on their property. This information could be used to determine if the system is still providing the intended results, or if education needs to be provided to landowners about the costs of not having pooling and unitization policies in place. Would the results again be widespread over drilling and waste or is there a way to improve the fairness of policies?

In conclusion, policy making is a continuous process, whereby solutions put in place to fix problems do not always provide anticipated results and often must be amended to meet the needs of a changing society. In oil and gas development, pooling and unitization represent a solution to a policy problem, but in today's climate of fast changing technology these fixed rules are being challenged because policies can't be adapted, or created and adopted, fast enough to meet societal needs.

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## APPENDIX A

### ADDITIONAL BINARY LOGISTIC REGRESSION RESULTS

Table A.1 Reasons for landownership and land use influence on leasing decisions

Dependent Variable – Did you agree to an oil or gas lease? Yes or No?		B	S.E.	Wald	df	Sig.	Exp(B)
Independent Variables	Agricultural Land	-0.370	0.468	0.624	1	0.429	0.691
	Forest Land	1.123	1.338	0.705	1	0.401	3.075
	Agricultural and Forest Land	0.155	0.560	0.077	1	0.782	1.168
	Beauty or scenery? (Somewhat Important)	0.688	0.933	0.543	1	0.461	1.989
	Beauty or scenery? (Very Important)	0.297	0.852	0.122	1	0.727	1.346
	Property Investment (Somewhat Important)	0.870	1.301	0.447	1	0.504	2.387
	Property Investment (Very Important)	0.411	1.291	0.101	1	0.750	1.509
	Timber production (Somewhat Important)	1.471	0.710	4.290	1	0.038	4.351

Table A.1 (continued)

Timber production (Very Important)	2.123	0.724	8.606	1	0.003	8.356
Protecting or improving wildlife habitat (Somewhat Important)	-0.353	0.965	0.134	1	0.715	0.703
Protecting or improving wildlife habitat (Very Important)	-0.559	1.008	0.308	1	0.579	0.572
Hunting (Somewhat Important)	0.164	0.689	0.057	1	0.812	1.179
Hunting (Very Important)	-0.752	0.650	1.338	1	0.247	0.472
Recreation (hiking, birding)(Somewhat Important)	0.013	0.503	0.001	1	0.980	1.013
Recreation (hiking, birding)(Very Important)	0.071	0.598	0.014	1	0.906	1.073
To pass the land down to my children (Somewhat Important)	0.761	0.821	0.860	1	0.354	2.140

Table A.1 (continued)

To pass the land down to my children (Very Important)	1.220	0.691	3.114	1	0.078	3.386
Primary residence (Somewhat Important)	0.658	0.672	0.957	1	0.328	1.931
It is my primary residence (Very Important)	0.852	0.450	3.583	1	0.058	2.344
Constant	-1.670	1.754	0.906	1	0.341	0.188

Table A.2 Reasons for landownership and land use influence on leasing decisions. (Continuous Variable)

Dependent Variable – Did you agree to an oil or gas lease? Yes or No?		B	S.E.	Wald	df	Sig.	Exp(B)
Independent Variables	Agricultural Land	-0.367	0.448	0.671	1	0.413	0.693
	Forest Land	0.645	1.308	0.243	1	0.622	1.905
	Both Agricultural and Forest Land	0.120	0.536	0.050	1	0.824	1.127
	Beauty or scenery	-0.039	0.385	0.010	1	0.920	0.962

Table A.2 (continued)

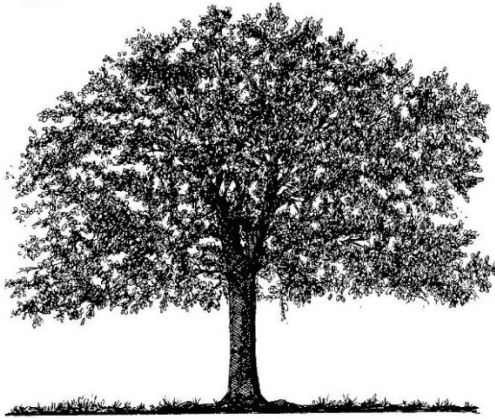
Property Investment	-0.183	0.403	0.206	1	0.650	0.833
Timber production	0.929	0.328	8.013	1	0.005	2.531
Protecting or improving wildlife habitat	-0.307	0.400	0.588	1	0.443	0.736
Hunting	-0.506	0.309	2.677	1	0.102	0.603
Recreation (hiking, birding)	-0.040	0.279	0.021	1	0.885	0.960
To pass the land down to my children	0.570	0.296	3.714	1	0.054	1.769
Primary residence	0.349	0.217	2.593	1	0.107	1.417
Constant	-0.514	1.463	0.123	1	0.725	0.598

Table A.3 Acreage size versus agreement to participate in an oil and gas lease.

Acreage Size	B	S.E.	Wald	df	Sig.	Exp(B)
1-50 Acres	0.62	1.10	0.31	1.00	0.58	1.86
51-150 Acres	-0.44	0.87	0.26	1.00	0.61	0.64
151-500 Acres	-0.53	0.85	0.40	1.00	0.53	0.59
500-1000 Acres	0.88	0.93	0.88	1.00	0.35	2.40
Over 1000 Acres	0.62	1.10	0.31	1.00	0.58	1.86
Constant	1.25	0.80	2.44	1.00	0.12	3.50

APPENDIX B  
LANDOWNER SURVEY

# Survey of Opinions on Oil & Gas Development in Mississippi



MISSISSIPPI STATE UNIVERSITY™  
EXTENSION



## Survey of Opinions on Oil & Gas Development in Mississippi

*Please take a moment to answer the following questions about your property/properties.*

1. In which Mississippi county/counties do you own land?  
\_\_\_\_\_
2. What is the total acreage of your properties? \_\_\_\_\_
3. Are you the primary landowner?  Yes  No
4. Which property description best describes your properties?
  - Forestland
  - Agricultural
  - Both

*Choose one of your properties to focus on during the remainder of the survey. All of the following questions should be answered with the selected property in mind.*

5. In which Mississippi county is your selected property located?  
\_\_\_\_\_
6. Do you own any mineral rights to this property?  Yes  No

7. Please indicate how important each of the following reasons for owning land is to you by checking one box for each line.

	Very Important	Somewhat Important	Not Important
7.1. Enjoying the beauty or scenery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.2. Property investment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.3. Timber production (saw logs, pulpwood, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.4. Protecting or improving wildlife habitat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.5. Hunting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.6. Nonhunting recreation (hiking, birding, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.7. To pass the land down to my children or other heirs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.8. It is my primary residence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.9. Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1

8. From the previous table, which reason (1–9) for owning land is most important to you, and why?

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9. What concerns do you have regarding oil and gas development where your property is located? Please check one box for each line.			
	Very Important	Somewhat Important	Not Important
9.1. Traffic congestion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.2. Road safety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.3. Road maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.4. Affordable housing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.5. Quality housing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.6. Crime	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.7. Pipeline maintenance and safety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.8. Planning for accidents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.9. Water quality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.10. Gas pipeline right of way	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.11. Protecting income gained from natural resources (hunting, fishing, timber, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.12. Not enough local input into regulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.13. Environmental protection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.14. Whether or not hydraulic fracturing technology will be used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. Rate the level of importance of each of the potential positive impacts of oil and gas development. Please check one box for each line.			
	Very Important	Somewhat Important	Not Important
10.1. Improved U.S. energy security	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.2. Lower energy prices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.3. Job creation for local residents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.4. Tax revenue generated from oil and gas development utilized locally	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.5. Tax revenue generated from oil and gas development utilized by the state	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.6. Job creation for people other than local residents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.7. Improvements in economic development in the area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. What is your greatest concern about oil and gas development?

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12. Are you knowledgeable of legislation/policies that regulate oil and gas development in Mississippi?

Yes  No

2

13. If yes, where did you gain your knowledge about oil/gas policies and legislation? Check all that apply.
- |  |  |
|--|--|
| <input type="checkbox"/> University-based educational programs   | <input type="checkbox"/> Nonlocal news media                                   |
| <input type="checkbox"/> Government information (non-university) | <input type="checkbox"/> Social networking platforms (Facebook, Twitter, etc.) |
| <input type="checkbox"/> Civic or social groups                  | <input type="checkbox"/> Websites  |
| <input type="checkbox"/> Oil and gas industry                    | <input type="checkbox"/> Friends and family                                    |
| <input type="checkbox"/> Environmental advocacy groups           | <input type="checkbox"/> Other _____   |
| <input type="checkbox"/> Local news media                        |  |
14. Many environmental issues involve difficult tradeoffs. Which of the following statements BEST describes your view on environmental protection versus economic progress? Please check only one response.
- Decision-makers should place priority on protecting the environment even if it might hurt the economy.
- Decision-makers should place priority on economic benefits even if it might hurt the environment.
- The environment and the economy are equally important.
- I am not sure which (environment or economy) should be given higher priority.
15. Have you been approached by an oil and gas company wishing to lease your land?  Yes  No
16. If yes, did you agree to a lease?  Yes  No
17. If oil and gas drilling activities have occurred on your property, how pleased have you been with the process, as a whole?
- Very pleased
- Pleased
- Neutral
- Displeased
- Very displeased
18. How could this process be improved? Please check all that apply.
- |   |  |
|---|--|
| <input type="checkbox"/> Improved communication               | <input type="checkbox"/> Decreased noise production associated with drilling |
| <input type="checkbox"/> More transparency                    | <input type="checkbox"/> Fewer interruptions of previous land uses           |
| <input type="checkbox"/> More education                       | <input type="checkbox"/> Stronger landowner support network                  |
| <input type="checkbox"/> Better financial returns             | <input type="checkbox"/> Better or more safety precautions                   |
| <input type="checkbox"/> Better plan for property restoration | <input type="checkbox"/> Other _____   |

19. If you are not currently involved in an oil and gas lease on your property, how likely are you to consider leasing the property for oil/gas development?

- Likely
- Neutral
- Unlikely
- Unsure

20. If you agreed to an oil and gas lease, would any of the following conditions cause you to change your decision? Please check one box for each line.			
	Yes	Maybe	No
20.1. Your property is pooled with properties of other owners	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20.2. The oil/gas well or wells would be located on your property	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20.3. A road will need to be built on your property	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20.4. A pond containing wastewater created during the drilling process will be located on your property	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20.5. A personal well for drinking water is located on your property	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20.6. The oil/gas company would require the use of water located on your property, which could be used for other purposes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20.7. Higher lease prices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20.8. Higher oil prices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20.9. Hydraulic fracturing technology would be used on your property	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

*Finally, we need to ask some questions about you, your property, your household, and your community. This information, as with all the information provided by you in this survey, will be used for statistical analysis only and will remain strictly confidential.*

21. In general, what is your satisfaction level with life in this community? Please check one.

- Very satisfied
- Satisfied
- Neutral
- Unsatisfied
- Very unsatisfied

22. Please read the following statements and indicate whether you strongly disagree, disagree, agree, or strongly agree. Check one answer for each item.				
	Strongly Agree	Agree	Disagree	Strongly Disagree
22.1. Overall, I am very attached to this community.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22.2. I feel like I belong in this community.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22.3. The friendships and associations I have with other people in this community mean a lot to me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22.4. If the people in this community were planning something, I'd think of it as something WE were doing rather than THEY were doing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22.5. If I needed advice about something, I could go to someone in this community.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22.6. I think I agree with most people in this community about what is important in life.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22.7. Given the opportunity, I would move out of this community.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22.8. I feel loyal to the people in this community.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22.9. I plan to remain a resident of this community for a number of years.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22.10. I like to think of myself as similar to the people who live in this community.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22.11. The future success of this community is very important to me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23. How long have you lived in your community? \_\_\_\_ years \_\_\_\_ months

24. Do you or any member of your immediate household own the mineral rights to any parcel of land in Mississippi?  Yes  No

25. If yes, are you or any member of your immediate household receiving royalties from said mineral rights?  
 Yes  No

26. Are you (or were you ever) employed in an occupation related to the oil and gas industry?  Yes  No

27. Are any of your friends or relatives employed (either full-time or part-time) in an occupation related to the oil and gas industry? Please check all that apply.

- Family member
- Close friend
- Neighbor
- None

28. What year were you born? \_\_\_\_\_

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29. What is your gender?  Male  Female

30. Which of the following best describes the political party with which you affiliate? Please check one.

- Democratic Party
- Republican Party
- Independent Party
- Other \_\_\_\_\_

31. How would you describe your political values within your indicated party? Please check one.

- Conservative
- Moderate conservative
- Moderate
- Moderate liberal
- Liberal

32. Do you belong to any of the following groups or organizations?

- Farm Bureau
- Forestry association
- Sierra Club
- Local political party
- Environmental protection organization
- Garden club
- Cattlemen's association
- Other \_\_\_\_\_

33. What was the total gross income (before taxes) of your household last year? Please check one.

- Less than \$45,000
- \$45,000 to \$64,999
- \$65,000 to \$84,999
- \$85,000 to \$104,999
- \$105,000 to \$124,999
- \$125,000 to \$144,999
- \$145,000 to \$164,999
- \$165,000 to \$184,999
- More than \$185,000

34. What is your highest level of education? Please check one.

- Did not complete high school
- High school
- Some college or post-high school training
- Technical school or GED
- Associate's or 2-year vocational degree
- Bachelor's degree
- Graduate/Professional degree



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