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Energy & Local Economies

The Relationship between Oil and Gas Development and Landowners

In McKenzie, Richland, Sheridan, and Tioga Counties

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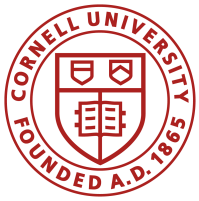

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INTRODUCTION

The purpose of this survey was to identify the effects that unconventional oil and gas drilling had on landowners in various counties and the ways in which those individuals tried to mitigate and manage the impacts of said development. It was sent to individuals that own land in Richland County, Montana; McKenzie County, North Dakota; Sheridan County, Wyoming; and Tioga County, Pennsylvania. These counties were selected based on their background with unconventional oil and gas drilling, which is representative of a larger experience in each state.

Richland County is located in the rural, rolling landscapes of northeastern Montana and covers approximately 2,104 square miles, with a population of 11,576 (US Census 2014). More than 6,400 of those residing in Richland County live in Sidney, the largest city within the county. Regional oil and gas activities began here in the early 2000s, with the number of wells drilled peaking in 2006 with 164 new wells drilled that year. As of 2014, drilling activity has slowed and with it, Sidney is returning back to “pre-boom” conditions such as less traffic, shorter lines, and a general slower pace of life.

McKenzie County is located on the Western side of North Dakota and borders the state of Montana. According to the U.S. Census, it spans 2,760 square miles and as of 2016, the population was estimated to be approximately 12,621. Unconventional oil and gas well drilling in McKenzie county peaked in 2011 with 457 new wells drilled in that year alone.

Sheridan county, Wyoming covers 1.3 million acres, including a large region in northeast Wyoming known as the Powder River Basin, where ranching and coal production are long mainstays of the local economy. There was a period of rapid and intensive coalbed methane development between 1998-2008, but after the decline in the natural gas market, there are approximately 4,000 abandoned wells that remain on farms and ranches throughout the state. As of 2015, the population was 29,738 (US Census 2015).

Tioga County, located in Northern Pennsylvania bordering New York, has among the largest number of wells drilled per county in PA. Well drilling in Tioga peaked in 2010 with 276 new wells drilled that year. Tioga is similar to a typical drilling county in Pennsylvania, but thus far less studied than others. The most recent county population estimate from the US Census is 41,467 (2016) and the land area is 1,134 square miles (US Census 2010).

This report will present the data that was collected from the business owner survey sent out in Richland, McKenzie, Sheridan, and Tioga counties, and will provide a fundamental analysis of said data. The study is primarily concerned with, but not limited to, comparisons made across the four participating states.

The analysis will identify trends in the data that demonstrates the effects that oil or gas development has had on landowners in each of the four counties. By studying those trends, society can learn more about oil and gas development in general and how its effects vary in different locations, perhaps based on particular features of each county and/or state.

METHODOLOGY II

SURVEY ADMINISTRATION

The survey was sent to individuals that own land in Richland County, Montana; McKenzie County, North Dakota; Sheridan County, Wyoming; and Tioga County, Pennsylvania.The survey was administered in the spring of 2016 by Penn State's Survey Research Center to ensure consistency across the four states. Individuals sampled for the survey had the choice to respond by mail or by web. Selected individuals received a total of three mailings: an initial mailing of the survey, a follow-up postcard, and a subsequent second full mailing to nonresponders.

FORMAT

The survey focused on how landowners are responding to the unconventional oil or gas development occurring in their area. It consisted of five sections. The first section titled "Oil and Gas Activities on Land You Own or Use" consisted of questions regarding the ownership status of the land in the surveyed county, the quantity of owned land, the primary current uses of that land, as well as the ownership status of mineral rights on the land. This section of the survey also asked landowners about the presence of oil or gas infrastructure located on their land and about how oil or gas development may have affected their ability to use their land located in the

studied counties. Those who were surveyed but did not own land in the surveyed county were directed to move on to the second section of the survey.

The second section, entitled “Your Agricultural Activities”, included questions specifically related to the agricultural practices of landowners. Respondents were asked if they or someone in their family farmed and about their main agricultural products of present date and of 10 years ago. Those who responded that neither they nor their family farmed were directed to move on to the fourth section of the survey.

The third, titled “Oil or Gas Development and Your Farm or Ranch Operation”, contained more questions for those landowners who were engaged with agricultural production on their land. These questions pertained to asking about both the positive and negative effects of oil or gas development on their farming operation. Additionally, this section also asked about any potential changes in management practices that occurred in response to oil or gas development.

The fourth section titled, “Lease, Bonus and Royalties”, asked questions related to leasing status, to whether or not anyone in the household is or was receiving leasing and royalty payments, and, if so, how they have managed and/or spent this income. This section also asked about any benefits and/or costs that a landowner experienced as a result of oil or gas development in their county.

The fifth and last section of the survey, “About You and Your Household,” collected demographic information about the landowner and about their household. At the end of the survey, respondents were asked to share any final comments they had relating to oil and gas development in their community. Respondents were also asked to indicate whether they would be interested in seeing the results of this study and were given space to provide an email address that would be used to send the final results electronically. The completed survey instrument is located in the appendix of this report.

SAMPLING

A total of 250 landowners were selected from each of the four counties, for a total sample size of 1,000 individuals. The samples were drawn from a combination of commercially available listings of property owners and GIS data on well locations obtained from city planning offices. The survey responses were coded and entered into a database for analysis using SAS. Primarily, this report uses bivariate techniques such as frequency counts, cross-tabulation, and descriptive statistics to observe trends in the data.

DEMOGRAPHICS OF RESPONDENTS

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LOCATION

In total, there were 242 respondents for the survey sent out to landowners in all four counties (see Table 1). The states are almost equally represented, as far as land ownership goes, with more representation coming from landowners in Wyoming (27.7%) and Pennsylvania (29.8%), than from North Dakota (21.5%) and Montana (21.1%).

Table 1. Land ownership location

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
McKenzie ND	52	21.5%	52	21.5%
Richland MT	51	21.1%	103	42.6%
Sheridan WY	67	27.7%	170	70.3%
Tioga PA	72	29.8%	242	100.00%

Not all of the survey respondents resided in the counties that they own land in, or even in the states that they own land in. Approximately 11% of respondents reside in a state other than North Dakota, Montana, Wyoming, or Pennsylvania. Some of the “other” states that individuals reside in are California, Delaware, New York, Florida, Illinois, Kansas, Michigan, New Mexico, Ohio, Oregon, Texas, and Washington state.

For the most part, the majority of respondents who own land in each of the four states also reside in those states. Sixty seven percent of those who own land in North Dakota also live in North Dakota (see Table 2). About 19% of those who own land in North Dakota live in other states, and 13.5% reside in Montana. Of those who own land in Montana, 88.2% reside in Montana and about 10% reside in other states. Two percent own land in Montana but reside in North Dakota. From this data, it appears that it is much more likely for people living in North Dakota to own land in Montana, than it is for people living in Montana to own land in North Dakota.

Approximately 96% of those who own land in Pennsylvania also reside there, with the remaining 4% residing in other places (states other than North Dakota, Montana, Wyoming, or Pennsylvania). Of those who own land in Wyoming, 86.6% live in Wyoming, 1.5% live in Montana, and 11.9% live in other states.

Table 2. State of residence vs. location of owned land
Percent of Respondents (number)

	States of residence					
	North Dakota	Montana	Wyoming	Pennsylvania	Other	Total
North Dakota	67.3% (35)	13.5% (7)	0% (0)	0% (0)	19.2% (10)	21.5% (52)
Montana	2% (1)	88.2% (45)	0% (0)	0% (0)	9.8% (5)	21.1% (51)
Wyoming	0% (0)	1.5% (1)	86.6% (58)	0% (0)	11.9% (8)	27.7% (67)
Pennsylvania	0% (0)	0% (0)	0% (0)	95.8% (69)	4.2% (3)	29.8% (72)
Total	14.9% (36)	21.9% (53)	24% (58)	28.5% (69)	10.7% (26)	242

PERSONAL CHARACTERISTICS

The youngest respondent was 28 years old, the oldest was 95, and the average age of respondents was 65. Overall, 38% were between the ages of 65 and 79, 33.5% were between the ages of 50 and 64, 16.9% were less than 50, and 11.6% were age 80 or older (see Table 3). Wyoming had the highest rate of respondents who were less than 50 years old (22.4%) and also the highest rate of respondents were were older than 80 years old (14.9%). North Dakota also had a fairly high rate of respondents less than 50 years old at 17.3%, but also only had about 6% of people age 80 or older. In each of the four states, between 62-77% of respondents were between the ages of 50 and 79.

Approximately 72% of all respondents were male and the remaining 28% were female (see Table 4). This approximate rate also appeared in each of the states individually except in North Dakota where 34% of respondents were female.

Table 3. Age
Percent of Respondents (number)

	Less than 50	50-64	65-79	80+
North Dakota	17.3% (9)	38.5% (20)	38.5% (20)	5.8% (3)
Montana	11.8% (6)	35.3% (18)	39.2% (20)	13.7% (7)
Wyoming	22.4% (15)	31.3% (21)	31.3% (21)	14.9% (10)
Pennsylvania	15.3% (11)	30.6% (22)	43.1% (31)	11.1% (8)
Total	16.9% (41)	33.5% (81)	38% (92)	11.6% (28)

Frequency Missing= 0

Table 4. Gender
Percent of Respondents (number)

	Male	Female
North Dakota	66% (33)	34% (17)
Montana	70.2% (33)	29.8% (14)
Wyoming	78.7% (48)	21.3% (13)
Pennsylvania	72.7% (48)	27.3% (18)
Total	72.3% (162)	27.7% (62)

Frequency Missing= 18

As far as employment status goes, the majority of all respondents were retired (45.4%). One third of all respondents reported being self employed, and 17.1% were employed by someone else. About 3% were homemakers, and those who were unemployed (both seeking and not seeking a job) made up 1% of all surveyed individuals. Each state followed a similar pattern. The most popular employment status in every state was retired, followed by self-employed, than employed by someone else. Between 1-5% of individuals in each state reported their employment status as homemaker. In Montana, 2.4% of respondents claimed they were unemployed and seeking a job, and in North Dakota 2.1% of respondents claimed they were unemployed and not seeking a job.

Table 5. Employment status Percent of Respondents (number)					
	North Dakota	Montana	Wyoming	Pennsylvania	Total
Homemaker	4.2% (2)	4.8% (2)	1.7% (1)	2.9% (2)	3.2% (7)
Self employed	37.5% (18)	35.7% (15)	37.9% (22)	25% (17)	33.3% (72)
Employed by someone else	10.4% (5)	19.1% (8)	17.2% (10)	20.6% (14)	17.1% (37)
Unemployed and seeking a job	0% (0)	2.4% (1)	0% (0)	0% (0)	0.5% (1)
Unemployed and not seeking a job	2.1% (1)	0% (0)	0% (0)	0% (0)	0.5% (1)
Retired	45.8% (22)	38.1% (16)	43.1% (25)	51.5% (35)	45.4% (98)

Frequency Missing= 26

The most popular type of current occupation held was farming and ranching, with 29% of all respondents claiming such jobs (see Table 6). About 15% hold jobs in construction and machinery, 11% in engineering and mechanics, 11% in healthcare, 11% in finance, insurance, and real estate, and 11% are business owners. Education and public service and "other" types of job each make up for nearly 10% of respondents. The least reported type of current occupation was oil and gas with 6.5%.

Table 6. Current occupations 86.1% (62)

Farming/ranching **29% (18)**

- Farm/ranch (4)
- Farmer (2)
- Farmer/Truck driver*
- Dairy farmer
- Hay farmer
- Business manager- Farmer & Rancher*
- Mechanical contractor/Beef farm*
- Oil field consultant/Farmer,rancher*
- Cattle rancher and hunting guide
- Ranch (2)
- Rancher, Financial advisor*
- Bookkeeper for the farm
- Horticulturist

Engineering and mechanics **11.3% (7)**

- Engineer
- Engineering associate- electric
- Registered Prof. engineer
- Mechanical contractor/Beef farm*
- Machinist/toolmaker
- Mechanic
- Environmental project manager

Healthcare **11.3% (7)** ● Nurse and enterprise driver* ● Registered Nurse ● Licensed clinical social worker ● Health care ● Pharmacist ● Surgical assistant ● Sidney Health Center	Business owner **11.3% (7)** ● Business Manager- Farmer & Rancher* ● Business Owner ● Business man ● Agribusiness President ● Retail store owner ● Self employed (2)
Education and public service **9.7% (6)** ● Teacher ● Physical education teacher ● Planner ● Law Enforcement ● Professional fire fighting ● State employee	Finance, insurance, and real estate **11.3% (7)** ● Rancher, Financial advisor* ● Finance- Construction* ● AP Manager in manufacturing ● Insurance surveyor ● Oil & gas accounting* ● Property management ● Land surveying
Construction and machinery **14.5% (9)** ● Construction ● Finance- Construction* ● Farmer/Truck driver* ● Truck driver ● Crude oil hauler* ● Heavy equipment operator ● Backhoe operator ● Grinder/Press operator ● Road dept/Equipment operator	Oil and gas **6.5% (4)** ● Oil field consultant/farmer, rancher* ● Oil & gas accounting* ● Crude oil hauler* ● Lease operator
Other **9.7% (6)** ● Caregiver/taxidermist ● General manager ● Maintenance Supervisor ● S/W developer ● This is a corporation ● Nurse and enterprise driver*	

Approximately 14% of respondents listed their previous occupations, noting that they were now retired. Thirty percent of retired landowners were previous farmer's, 30% were business owners, and 30% had other various jobs before they retired (see Table 7). Twenty percent worked in education and public service, 10% worked in health care, and 10% worked in finance, insurance, and real estate.

Table 7. Retired occupations 13.9% (10)	
Farming/ranching **30% (3)** ● Farmer (semi-retired) ● Retired dairy farmer since 1986 then retired business (store owner) in 2003* ● Retired farmer	Healthcare **10% (1)** ● Retired RN
Business owner **30% (3)** ● Retired dairy farmer since 1986 then retired business (store owner) in 2003* ● Insurance agency owner before retiring* ● Retired teacher, golf shop proprietor*	Education and public service **20% (2)** ● Retired teacher ● Retired teacher, golf shop proprietor*
Finance, insurance, and real estate **10% (1)** ● Insurance agency owner before retiring*	Other **30% (3)** ● Retired and son looking for a job ● Retired attorney ● Retired but very active in handling gas development issues and problems. Also very active in ranch improvements and new construction

Most of the individuals surveyed have never been employed directly by the oil and gas industry. About four percent are currently, directly employed by the industry and about 9% are not currently directly, employed by the industry but were at one time (see Table 8). North Dakota had the highest rate of respondents who are currently employed by the oil and gas industry at 10%, followed by Montana at about 8%, then Wyoming at only 1.6%. No one from Pennsylvania was currently, directly employed by the oil and gas industry. However, about 6% of respondents from Pennsylvania reported that although they are not currently employed by the oil and gas industry, they were at one time. North Dakota also had the highest rate of these respondents at 16% followed by Montana at 10.4%. In Wyoming, approximately 5% of respondents used to be employed by the oil and gas industry.

Table 8. Directly employed by oil/gas industry Percent of Respondents (number)			
	Yes, currently employed by oil/gas industry	Not currently, but was employed at one time by oil/gas industry	No
North Dakota	10% (5)	16% (8)	74% (37)
Montana	8.3% (4)	10.4% (5)	81.3% (39)
Wyoming	1.6% (1)	4.8% (3)	93.6% (58)
Pennsylvania	0% (0)	5.9% (4)	94.1% (64)
Total	4.4% (10)	8.8% (20)	86.8% (198)

Frequency Missing= 14

HOUSEHOLD

Overall, the majority of respondents reported a household size of two individuals (63.7%) (see Table 9). Nineteen percent reported a household size of one, 5% reported 3, and 7% reported 4.
Average household size overall was approximately 2 individuals. The data is analogous by state; most people in each of the four states reported a household size of two, followed by one.

When asked to report their total household income in 2015, responses varied. Approximately 20% of all individuals reported their household income was $200,000 or more, but on the other hand, about 18% reported between $25,000 and $49,999 and about 16% reported between $50,000 and $74,999 (see Table 9). Between $10,000 and $24,999, $75,000 and $99,999, and $150,000 to $199,999 each had approximately 10-11% report such income levels. Only 3% of all respondents reported their household incomes being less than $10,000 in the year 2015.

By far, North Dakota had the highest rate of respondents claiming a household income of $200,000 or more at 47.5%, followed by Wyoming at 17%, Montana at 12.2%, and Pennsylvania at 8.6% (see Table 10). North Dakota was also the only state that had 0% of individuals with less than $25,000 in household income. To put this in perspective, the rate of individuals reporting less than $25,000 was 9.7% in Montana, 17% in Wyoming, and 22.4% in Pennsylvania.

Table 9. Household size Percent of Respondents (number)								
	Number of household members							
	1	2	3	4	5	6	9	10
North Dakota	15.7% (8)	70.6% (36)	3.9% (2)	7.8% (4)	2% (1)	0% (0)	0% (0)	0% (0)
Montana	17.4% (8)	67.4% (31)	2.2% (1)	8.7% (4)	4.4% (2)	0% (0)	0% (0)	0% (0)
Wyoming	21.7% (13)	58.3% (35)	6.7% (4)	5% (3)	5% (3)	1.7% (1)	1.7% (1)	0% (0)
Pennsylvania	20.3% (14)	60.9% (42)	7.3% (5)	7.3% (5)	1.5% (1)	0% (0)	1.5% (1)	1.5% (1)
Total	19% (43)	63.7% (144)	5.3% (12)	7.1% (16)	3.1% (7)	0.4% (1)	0.9% (2)	0.4% (1)

Frequency Missing= 16

Table 10. Household income Percent of Respondents (number)					
	North Dakota	Montana	Wyoming	Pennsylvania	Total
Less than $10,000	0% (0)	2.4% (1)	7.6% (4)	1.7% (1)	3.1% (6)
$10,000- $24,999	0% (0)	7.3% (3)	9.4% (5)	20.7% (12)	10.4% (20)
$25,000- $49,999	7.5% (3)	26.8% (11)	20.8% (11)	15.5% (9)	17.7% (34)
$50,000- $74,999	5% (2)	17.1% (7)	18.9% (10)	20.7% (12)	16.2% (31)
$75,000- $99,999	7.5% (3)	7.3% (3)	5.7% (3)	15.5% (9)	9.4% (18)
$100,000- $149,999	12.5% (5)	14.6% (6)	9.4% (5)	13.8% (8)	12.5% (24)
$150,000- $199,999	20% (8)	12.2% (5)	11.3% (6)	3.5% (2)	10.9% (21)
$200,000 or more	47.5% (19)	12.2% (5)	17% (9)	8.6% (5)	19.8% (38)

Frequency Missing= 50

LAND DATA

IV

OWNERSHIP

There was great variation in terms of the number of acres that individuals own in each of the four counties that were surveyed. Pennsylvania had the highest rate of respondents owning 10 or fewer acres (20.6%) and the lowest rate of those owning more than 3,000 acres (8.8%) (see Table 11).In both North Dakota and Montana, responses varied but the highest rates came from those owning between 301 and 1,000 acres (29.8% and 37.5%), followed by those owning between 1,001-3000 acres (27.7% and 27.5%). Responses from Wyoming varied as well, although they did have the highest rate of individuals owning more than 3,000 acres (31.4%).

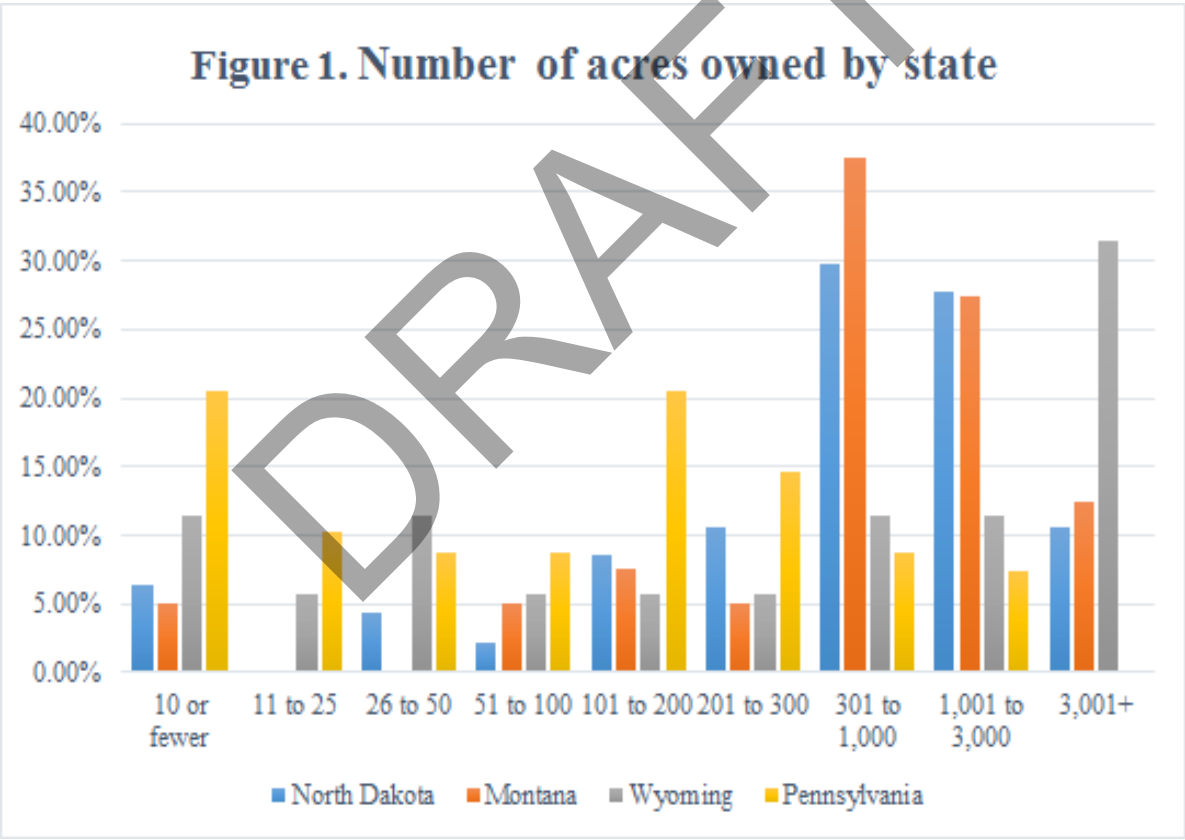

Table 11. Amount of acres owned Percent of Respondents (number)					
	North Dakota	Montana	Wyoming	Pennsylvania	Total
10 or fewer	6.4% (3)	5% (2)	11.4% (4)	20.6% (14)	12.1% (23)
11-25	0% (0)	0% (0)	5.7% (2)	10.3% (7)	4.7% (9)
26-50	4.3% (2)	0% (0)	11.4% (4)	8.8% (6)	6.3% (12)
51-100	2.1% (1)	5% (2)	5.7% (2)	8.8% (6)	5.8% (11)
101-200	8.5% (4)	7.5% (3)	5.7% (2)	20.6% (14)	12.1% (23)
201-300	10.6% (5)	5% (2)	5.7% (2)	14.7% (10)	10% (19)
301-1000	29.8% (14)	37.5% (15)	11.4% (4)	8.8% (6)	20.5% (39)
1001-3000	27.7% (13)	27.5% (11)	11.4% (4)	7.4% (5)	17.4% (33)
3001+	10.6% (5)	12.5% (5)	31.4% (11)	0% (0)	11.1% (21)

Frequency Missing= 52

More than one third of all respondents (35.1%) said they obtained the land that they own between the years of 1961-1990 (see Table 12). About another third (33.9%) obtained the land that they own in the year 1960 or earlier. About 14% said between the years 1991-2000, 6.2% said between 2001-2005, 3.3% said between 2006-2008, and 7.9% said they obtained the land that they own in the year 2009 or later.

In North Dakota, 46.2% purchased their land in the year 1960 or earlier and 23.1% did between the years 1961-1990. The remaining respondents obtained their land between 1991 and the present, with 13.5% purchasing their land in the year 2009 or later. The results are similar in Montana and Wyoming where the most respondents got their land in 1960 or earlier, followed by those who got their land between the years of 1961-1990. No one in Montana purchased their land between the years 2001-2005. In Pennsylvania, half of respondents obtained land between 1961-1990, with only 20.8% claiming 1960 or earlier. The remaining respondents reported obtaining their land between the years 1991-2008. No one in Pennsylvania purchased the land that they own after 2008.

Table 12. Year that land was first obtained Percent of Respondents (number)					
	North Dakota	Montana	Wyoming	Pennsylvania	Total
1960 or earlier	46.2% (24)	39.2% (20)	34.3% (23)	20.8% (15)	33.9% (82)
1961-1990	23.1% (12)	37.3% (19)	26.9% (18)	50% (36)	35.1% (85)
1991-2000	11.5% (6)	9.8% (5)	14.9% (10)	16.7% (12)	13.6% (33)
2001-2005	3.8% (2)	0% (0)	10.4% (7)	8.3% (6)	6.2% (15)
2006-2008	1.9% (1)	3.9% (2)	3% (2)	4.2% (3)	3.3% (8)
2009 or later	13.5% (7)	9.8% (5)	10.4% (7)	0% (0)	7.9% (19)

Frequency Missing= 0

The primary current uses of respondents land were super grouped into the following categories:

1. Residential
2. Agricultural
    a. Grassland, pasture, or rangeland
    b. Cropland
    c. Forest land
    d. Miscellaneous farmland
3. Commercial/Industrial
4. Recreational
    a. Recreational with second home (vacation/camp)
    b. Recreational without second home
5. Other

Overall, the most popular type of current land use was agricultural, with 85.1% of all respondents reporting that their land is primarily used as grassland, pasture, or rangeland, cropland, forest land, or miscellaneous farmland (see Table 13). The next most popular type of primary land use across all respondents was residential (57.4%), followed by recreational (10.3%), other (6.1%), and commercial or industrial (4.8).

In each state individually, agricultural was the most popular type of primary land use, followed by residential (except in Pennsylvania where residential and agricultural both came in at 69.4%). North Dakota had the highest rate of landowners who reported that their land was primarily used for commercial or industrial purposes, at 8.2%. Pennsylvania had a significantly high amount of landowners report that their land was primarily used for recreational purposes (20.8%), relative to the other states.

Table 13. Primary current uses of land *Select all that apply* Percent of Respondents (number)					
	North Dakota	Montana	Wyoming	Pennsylvania	Total
Residential	30.6% (15)	56% (28)	65.2% (43)	69.4% (50)	57.4% (136)
Agricultural	94.2% (49)	84.3% (43)	95.5% (64)	69.4% (50)	85.1% (206)
Commercial/ Industrial	8.2% (4)	4.2% (2)	3.3% (2)	4.2% (3)	4.8% (11)
Recreational	5.8% (3)	2% (1)	9% (6)	20.8% (15)	10.3% (25)
Other	4.1% (2)	4.2% (2)	9.7% (6)	5.6% (4)	6.1% (14)

Frequency Missing= 5, 0, 13, 0, 12

Of those who own land, 63.6% reported that there is oil or gas infrastructures on their property, and 35.5% reported that there is not (see Table 14). About 1% of all respondents said that they did not know if there was an oil or gas infrastructure on the lands that they own or not. By state, North Dakota had the highest percent of respondents report having infrastructure on their properties at 78%, followed by Montana at 70%, Wyoming at 60%, and Pennsylvania at 52.1%. Both North Dakota and Montana had 2% of respondents report not knowing whether or not there was oil or gas infrastructure on their property.

Table 14. Oil/gas infrastructure on property Percent of Respondents (number)			
	No	Yes	Don't Know
North Dakota	20% (10)	78% (39)	2% (1)
Montana	28% (14)	70% (35)	2% (1)
Wyoming	40% (24)	60% (36)	0% (0)
Pennsylvania	47.9% (34)	52.1% (37)	0% (0)
Total	35.5% (82)	63.6% (147)	0.9% (2)

Frequency Missing= 11

Of those who do have oil/gas infrastructure on the land that they own, 79.6% claimed that there are actual oil and/or gas *pipelines* on their properties (see Table 15). About 75% of all respondents reported having oil/gas *wells* on their property, followed by 61.9% having *well pads*. The least common type of infrastructure on respondent's properties was *compressor station* at 15%.

In North Dakota, almost 90% of people had pipelines on their property, about 85% had wells, and about 72% had well pads. The least common type of infrastructure in North Dakota was compressor stations which only 15.4% of individuals reported having on their property. Compressor stations were also the least popular type of infrastructure in Montana with only 2.9% of respondents reporting they had them on their property. Nearly 90% of respondents from Wyoming had oil and/or gas wells on their property, and 77.8% had pipelines. In Pennsylvania, pipelines, wells, and well pads were the most common types of infrastructure found on property, and compressor stations were the least common.

Table 15. Type of oil/gas infrastructure on property
Percent of Respondents (number)

	Oil and/or gas wells	Oil and/or gas well pads	Compressor stations	Water gathering sites	Produced-water disposal sites	Oil and/or gas pipelines
North Dakota	84.6% (33)	71.8% (28)	15.4% (6)	18% (7)	23.1% (9)	89.7% (35)
Montana	77.1% (27)	60% (21)	2.9% (1)	5.7% (2)	5.7% (2)	74.3% (26)
Wyoming	88.9% (32)	52.8% (19)	33.3% (12)	36.1% (13)	25% (9)	77.8% (28)
Pennsylvania	48.7% (18)	62.2% (23)	8.1% (3)	8.1% (3)	10.8% (4)	75.7% (28)
Total	74.8% (110)	61.9% (91)	15% (22)	17% (25)	16.3% (24)	79.6% (117)

AGRICULTURAL ACTIVITY

About 44% of all respondents said that they, or someone in their family farms, such as for an occupation, to supplement household income or food, or other reasons (see Table 16). Montana had the highest rate of respondents (or respondents family members) who farm for work or income at 62.2%, followed by North Dakota at 44.7% and Wyoming at 42.4%. Only 32.4% of respondents from Pennsylvania claimed that they or someone in their family farm as an occupation or to supplement income.

Table 16. Farming occupations Percent of Respondents (number)		
	No	Yes
North Dakota	55.3% (26)	44.7% (21)
Montana	37.8% (17)	62.2% (28)
Wyoming	57.6% (34)	42.4% (25)
Pennsylvania	67.7% (46)	32.4% (22)
Total	56.2% (123)	43.8% (96)

Frequency Missing= 23

Currently, smaller areas of farmed/ranched land (0-99 acres) tend to be made up of mostly forest land. About 45% of respondents who farm or ranch no acres reported owning forest land (see Table 17). Thirty one percent of those farming or ranching 1-99 acres reporting owning forest land. However, as the amount of total acres farmed or ranched increases, the most popular type of land changes from forest land to croplands and pasturelands. Similar patterns occur when respondents were asked the same question but in reference to their land ten years ago. On smaller lands, forest land was the most popular type of land farmed/ranched but on larger properties (100-1000+ acres), cropland and pasture land was more common. It should be noted that those respondents who replied "none" have implied that they own an amount of cropland, pastureland, and/or forestland, but do not use any of said land acres to farm and/or ranch.

Table 17. Total acres farmed/ranched Percent of Respondents (number)						
	Currently			**10 years ago**		
	Cropland	Pastureland	Forest land	Cropland	Pastureland	Forest land
None	7.1% (6)	4.2% (4)	45.2% (19)	10.5% (9)	4.3% (4)	41.9% (18)
1-99 ac.	17.9% (15)	18.8% (18)	31% (13)	15.1% (13)	19.4% (18)	32.6% (14)
100-500 ac.	46.4% (39)	28.1% (27)	19% (8)	43% (37)	24.7% (23)	20.9% (9)
501-1000 ac.	16.7% (14)	5.2% (5)	0% (0)	16.3% (14)	8.6% (8)	0% (0)
>1000 ac.	11.9% (10)	43.8% (42)	4.8% (2)	15.1% (13)	43% (40)	4.7% (2)

Frequency Missing= 158, 146, 200 Frequency Missing= 156, 149, 199

Currently overall, the most popular type of main agricultural product was beef cattle, with 46.8% of all respondents reporting that beef cattle makes up at least 50% of gross sales on their farm (see Table 18). The next most popular responses overall were cash grains at 16.9% and dairy at 10.4%. Other livestock, field crops excluding cash grains, animal specialities and “other” came in at between about 4-7% each. Poultry and eggs, fruits and tree nuts, vegetables and melons, and horticultural specialities made up 0% of overall responses. About 4% of individuals reported that none of the listed products provided over half of their gross sales. For clarification, other livestock includes animals such as swine, sheep, and goats. Cash grains includes corn, wheat, and soybeans. Field crops excluding cash grains refers to items such as tobacco and potatoes. Horticultural specialities includes ornamentals and nursery products, and animal specialties refers to fur bearing, horses, and aquaculture.

In Montana and Wyoming, the most popular type of main agricultural product was beef cattle. Respondents from North Dakota also reported beef cattle being one of the two most common types of main products currently, along with cash grains. In Pennsylvania, the most popular product was dairy at 41.2%, but no one in North Dakota or Wyoming reported dairy as a current, main agricultural product and only 4.6% did so in Montana.

Ten years ago, respondent's main agricultural products looked about the same. Beef cattle was the most popular type of main agricultural product at 47.9%, followed by cash grains at 16.9%, dairy at 11.3%, than field crops excluding cash grains, other livestock, animal specialities, and “other” coming in at between 1-10% each. About 4% of all respondents said that 10 years ago, none of the listed agricultural products accounted for over half of their gross sales.

Ten years ago, the most common, main agricultural products in each state were the same as they are now; dairy in Pennsylvania, beef cattle in Wyoming, beef cattle in Montana, and beef cattle and cash grains in North Dakota.

Table 18. Main agricultural product Percent of Respondents (number)										
	Currently					**10 years ago**				
	ND	MT	WY	PA	Total	ND	MT	WY	PA	Total
Dairy	0% (0)	4.6% (1)	0% (0)	41.2% (7)	10.4% (8)	0% (0)	0% (0)	0% (0)	57.1 % (8)	11.3% (8)
Beef cattle	41.2% (7)	45.5% (10)	76.2% (16)	17.7% (3)	46.8% (36)	38.9% (7)	50% (10)	84.2% (16)	7.1% (1)	47.9% (34)
Other Livestock	0% (0)	0% (0)	9.5% (2)	11.8% (2)	5.2% (4)	0% (0)	0% (0)	0% (0)	7.1% (1)	1.4% (1)
Cash Grains	41.2% (7)	18.2% (4)	4.8% (1)	5.9% (1)	16.9% (13)	38.9% (7)	20% (4)	5.3% (1)	0% (0)	16.9% (12)
Field Crops excluding Cash Grains	11.8% (2)	9.1% (2)	0% (0)	5.9% (1)	6.5% (5)	11.1% (2)	5% (1)	0% (0)	7.1% (1)	5.6% (4)
Animal Specialties	0% (0)	0% (0)	9.5% (2)	5.9% (1)	3.9% (3)	0% (0)	0% (0)	10.5% (2)	0% (0)	2.8% (2)
Other	5.9% (1)	13.6% (3)	0% (0)	5.9% (1)	6.5% (5)	11.1% (2)	20% (4)	0% (0)	7.1% (1)	9.9%(7)
None of the above provides over half of gross sales	0% (0)	9.1% (2)	0% (0)	5.9% (1)	3.9% (3)	0% (0)	5% (1)	0% (0)	14.3 % (2)	4.2% (3)
	Frequency Missing= 19					Frequency Missing= 25				

Of those who said that they or someone in their household farms, 23.6% claimed that their farm or ranch operations' approximate annual gross income was between $10,000 and $49,999, 19.1% said it was less than $10,000, and 13.5% said it was between $100,000 and $149,999. Nine percent of all respondents said that their annual gross farm/ranch income was $500,000 or more.

Pennsylvania had the highest rate of people say that their farm/ranch annual gross income was less than $110,000 at 35%, and the second highest rate of people that said it was between $10,000 and $49,999 at 25%. Another 20% claimed between $150,000 and $249,999, but no one in Pennsylvania reported their operation grossing more than $500,000 annually. On the

other hand, Wyoming had the highest rate of people whose operations grossed more than $500,000 annually at 17.4%. Approximately 43% though grossed $49,999 or less.

Montana had the lowest rate of respondents that reported less than $10,000 at 7.7%, and had the highest rates of those grossing between $10,000 and $49,999 and between $100,000 and $149,999 (26.9% each). Only about 4% reported more than $500,000.
Lastly, in North Dakota, results varied between 10-20% of respondents reporting each of the income categories. Fifteen percent reported that their farm or ranch operation grossed $500,000 or more annually.

Table 19. Annual gross farm/ranch income
Percent of Respondents (number)

	North Dakota	Montana	Wyoming	Pennsylvania	Total
<$10K	15% (3)	7.7% (2)	21.7% (5)	35% (7)	19.1% (17)
$10K- $49,999	20% (4)	26.9% (7)	21.7% (5)	25% (5)	23.6% (21)
$50K- $99,999	10% (2)	11.5% (3)	13% (3)	5% (1)	10.1% (9)
$100K- $149,999	15% (3)	26.9% (7)	4.4% (1)	5% (1)	13.5% (12)
$150K- $249,999	10% (2)	7.7% (2)	0% (0)	20% (4)	9% (8)
$250K- $499,999	15% (3)	11.5% (3)	8.7% (2)	5% (1)	10.1% (9)
$500K or more	15% (3)	3.9% (1)	17.4% (4)	0% (0)	9% (8)
Don’t know	0% (0)	3.9% (1)	13% (3)	5% (1)	5.6% (5)

Frequency Missing= 7

OIL AND GAS ACTIVITY

There was some disparity between states on the percent of respondents from each state that claimed the mineral rights on the land they owned had been leased for oil and gas development. Overall, 83% of landowners said that the mineral rights on the land that they own were leased for oil or gas development. In Wyoming, 56.4% said yes, the mineral rights were leased, but in North Dakota nearly 96% of respondents reported yes and in Pennsylvania about 94% reported yes (see Table 20). Eighty seven percent of respondents from Montana said that the mineral rights on the land that they own had been leased for oil and gas development.

Table 20. Leasing of mineral rights for oil/gas development
Percent of Respondents (number)

	No	Yes
North Dakota	4.1% (2)	95.9% (47)
Montana	13% (6)	87% (40)
Wyoming	43.6% (27)	56.4% (35)
Pennsylvania	5.6% (4)	94.4% (68)
Total	17% (39)	83% (190)

Frequency Missing= 13

Out of all respondents that said the mineral rights for the land that they own are leased, the majority (76.8%) claimed that they or someone in their household made the decision to lease mineral rights on their land (see Table 21). Twenty percent said that the prior owners made the decisions the lease mineral rights, and about 15% said that someone else did. Nearly the same data trend appears when looking at respondents from North Dakota and Montana; most respondents (~72%) said they or someone in their household was the decision maker, followed by prior owners, and someone else being the decision maker for the leasing of mineral rights. In Pennsylvania, 97% of people said they or someone else in their household were the decision makers for the leasing of mineral rights, with 6% claiming a prior owner was and only 3% claiming that someone else was. Wyoming had the lowest rate of people who were their own decision makers (or someone in their household) at 48.6%, and had the highest rate of people who said that someone else made the decision for the leasing of rights on their land at 34.3%

Table 21. Decision maker for leasing of mineral rights *Select all that apply* Percent of Respondents (number)			
	Prior owner	You or someone in your household	Someone else
North Dakota	19.6% (9)	72.3% (34)	12.8% (6)
Montana	35% (14)	72.5% (29)	20% (8)
Wyoming	32.4% (11)	48.6% (17)	34.3% (12)
Pennsylvania	6% (4)	97.1% (66)	2.9% (2)
Total	20.3% (38)	76.8% (146)	14.7% (28)

Frequency Missing= 3

Across all four states, the most popular type of ownership rights associated with oil or gas minerals on respondents land, was that the minerals are partially owned by surface owners (43%), closely followed by the minerals being fully owned by surface owners (40.5%) (see Table 22). On the other hand, 37% of all respondents reported that the minerals are privately owned by others (not surface owners). Additionally, about 12% said that the minerals on their land are owned by the federal government.

In North Dakota, 74% of landowners claimed that the oil and gas minerals associated with their land were partially owned by surface (land) owners, followed by 44% claiming they were privately owned by others, and 16% claiming they were fully owned by surface owners. In Montana, 62% said their land ownership rights were privately owned by others, 56% said they were partially owned by surface owners, and 26% said they were fully owned by surface owners. Similarly in Wyoming, results varied although half of respondents claimed that ownership rights were privately owned by others. Wyoming also had the highest rate of landowners who said that they didn't know what type of ownership rights are associated with their land at 14.5%, and the highest rate of landowners who said that they were owned by the federal government at 25.4%. On the other hand, in Pennsylvania, no one reported that their lands mineral rights were owned by the federal government. In Pennsylvania 84.5% of landowners said that the oil and gas mineral rights associated with their land were fully owned by surface owners.

Table 22. Type of ownership rights *Select all that apply* Percent of Respondents (number)						
	Fully owned by surface owners	Partially owned by surface owners	Owned by the federal government	Privately owned by others	Other ownership type	I don't know
North Dakota	16% (8)	74% (37)	8.2% (4)	44% (22)	16.3% (8)	6.1% (3)
Montana	26% (13)	56% (28)	16.3% (8)	62% (31)	6.3% (3)	4.2% (2)
Wyoming	20.3% (13)	42.2% (27)	25.4% (16)	50% (32)	14.3% (9)	14.5% (9)
Pennsylvania	84.5% (60)	12.7% (9)	0% (0)	2.8% (2)	1.4% (1)	5.6% (4)
Total	40.5% (94)	43% (101)	12.1% (28)	37% (87)	9.1% (21)	7.8% (18)

Frequency Missing= 10, 7, 10, 7, 11, 12

Overall, landowners whose mineral rights were leased were more likely to live on the property where rights were leased than not. This was also the case in Wyoming and Pennsylvania where 61.8% and 79.1% reported living on the property where rights were leased (see Table 23). In North Dakota and Montana though, the opposite was true and respondents were more likely to report *not* living on the property where rights were leased.

Table 23. Do you live on the property where rights were leased? Percent of Respondents (number)		
	No	Yes
North Dakota	63.8% (30)	36.2% (17)
Montana	55% (22)	45% (18)
Wyoming	38.2% (13)	61.8% (53)
Pennsylvania	20.9% (14)	79.1% (53)
Total	42% (79)	58% (109)

Frequency Missing= 2

Most respondents in each state reported that the mineral rights associated with their land were first leased for oil and gas development in the year 1960 or earlier (see Table 24). In North Dakota, nearly half had the rights from their land leased in 1960 or earlier, followed by 19.2%

who said that the rights were leased between 1961 and 1990, 10.6% between 2006 and 2008, 8.5% from 2009 to now, and 6.4% for both between 1991 and 2000, and 2001 to 2005. Respondents from Montana replied similarly, except that 35% of landowners said that rights were leased between 1961 and 1990, and no one reported having rights for their land leased in the years 2001 to 2005. In Wyoming, more than half of landowners said rights were leased in 1960 or earlier, about 23% said between 2001 and 2005, and 20% said between 1991 and 2000. No one in Wyoming had their land rights leased between 1961 and 1990, or between 2006 to 2008, and only 2.9% had rights leased from 2009 to now. Pennsylvania on the other hand had the highest rate of landowners who said that the rights associated with their land were first leased from 2009 to now, with 14.7%.

Table 24. Year rights first leased
Percent of Respondents (number)

	North Dakota	Montana	Wyoming	Pennsylvania	Total
1960 or earlier	48.9% (23)	42.5% (17)	54.3% (19)	36.8% (25)	44.2% (84)
1961-1990	19.2% (9)	35% (14)	0% (0)	10.3% (7)	15.8% (30)
1991-2000	6.4% (3)	5% (2)	20% (7)	5.9% (4)	8.4% (16)
2001-2005	6.4% (3)	0% (0)	22.9% (8)	11.8% (8)	10% (19)
2006-2008	10.6% (5)	7.5% (3)	0% (0)	20.6% (14)	11.6% (22)
2009 to now	8.5% (4)	10% (4)	2.9% (1)	14.7% (10)	10% (19)

For those cases in which the mineral rights associated with a parcel of land were leased in the year 1960 or earlier, about a quarter of landowners said they received $300-$1,000 per acre of bonus payment and about another quarter said they received $1,000-$2,500 per acre (see Table 25). About 20% received $50-$300, another 20% received only $1-$49, and only 8.7% received more than $2,500 per acre in bonus payment. In the years following, survey respondents seemed to receive more money on average per acre. The rate of landowners earning only $1-$49 per acre dropped to 15.8% in the years 1961-1990, and to 0% in the years 1991-2000. However, that rate jumped to 30.8% for those who leased the mineral lights associated with their land in the years 2000-2005. At that same time, the rate of landowners earning more than $2,500 per acre in bonus payments dropped to the lowest rate seen in the data set (7.7%).

For those landowners whose lands mineral rights were leased between 2006-2008, 50% were receiving $50-$300 per acre, 25% were receiving $1,000-$2,500 per acre, and 16.7% were receiving more than $2,500 per acre in bonus payments. If rights were leased anytime after

2009, a third of landowners reported receiving $50-$300 per acre, about 39% reported $1,000-$2,500 per acre, and 11.1% reported more than $2,500 per acre.

Table 25. Year leased by bonus payment
Percent of Respondents (number)

Year leased	Bonus payment				
	$1-$49	$50-$300	$300-$1,000	$1,000-$2,500	More than $2,500
1960 or earlier	19.6% (9)	21.7% (10)	26.1% (12)	23.9% (11)	8.7% (4)
1961-1990	15.8% (3)	31.6% (6)	36.8% (7)	5.3% (1)	10.5% (2)
1991-2000	0% (0)	55.6% (5)	22.2% (2)	11.1% (1)	11.1% (1)
2000-2005	30.8% (4)	15.4% (2)	38.5% (5)	7.7% (1)	7.7% (1)
2006-2008	8.3% (1)	50% (6)	0% (0)	25% (3)	16.7% (2)
2009 to now	5.6% (1)	33.3% (6)	11.1% (2)	38.9% (7)	11.1% (2)

Frequency Missing= 125

Across all four states, by far the most popular reason that respondents leased their mineral rights was because they wanted the income (76%) (see Table 26). This was also, by far, the most common reason in each of the four states individually. Approximately 41% of all respondents said that they leased mineral rights because they did not expect it to affect their use of the land, and 20.4% said the price was right. Nearly 10% said a reason for leasing their mineral rights was because everyone was doing it. For each of the following reasons, between 1-5% of all respondents selected: did not use the land being drilled, did not live on the land being drilled, pressure from neighbors or others, required by law to do so, did not know, and other.

In North Dakota, after wanting the income, the most common reasons people leased their mineral rights were because they did not expect it to affect their use of the land, and the price was right. No one from North Dakota said that they were required to do so by law. The case was similar in both Montana and Wyoming where the top three reasons people leased their rights were because they wanted the income, they did not expect it to affect their use of the land, and the price was right. In Wyoming though, 10.5% said that they were required to do so by law, and no one leased rights because they either did not use or did not live on the land being drilled. Pennsylvania had the highest rate of individuals who leased rights because everyone else was doing it (13.9%).

Of the “other” reasons that landowners ended up leasing the mineral rights on their land, almost half (47.8%) of them were reasons out of the respondents control, such as the rights being leased by a previous owner (see Table 27). About 22% were for the extra income or to pay for something, 13% were because landowners underestimated the effects of leasing the rights, and 13% were because of pressure from the oil and gas industry.

Table 26. Reasons for leasing mineral rights
Select all that apply
Percent of Respondents (number)

	North Dakota	Montana	Wyoming	Pennsylvania	Total
Wanted the income	80.6% (29)	86.2% (25)	57.9% (11)	74.2% (49)	76% (114)
Do not use the land being drilled	2.9% (1)	6.9% (2)	0% (0)	0% (0)	2% (3)
Do not live on the land being drilled	2.9% (1)	6.9% (2)	0% (0)	4.6% (3)	4.1% (6)
The price was right	17.7% (6)	44.8% (13)	21.1% (4)	10.8% (7)	20.4% (30)
Did not expect it to affect my use of the land	26.5% (9)	44.8% (13)	31.6% (6)	48.5% (32)	40.5% (60)
Pressure from neighbors or others	2.9% (1)	3.5% (1)	5.3% (1)	3.1% (2)	3.4% (5)
Because everyone was doing it	5.9% (2)	3.5% (1)	10.5% (2)	13.9% (9)	9.5% (14)
Required by law to do so	0% (0)	0% (0)	10.5% (2)	0% (0)	1.4% (2)
Don’t know	0% (0)	3.5% (1)	5.3% (1)	3.1% (2)	2.7% (4)
Other	0% (0)	3.5% (1)	5.3% (1)	3.1% (2)	2.7% (4)

Frequency Missing= 1, 4, 4, 4, 3, 4, 4, 4, 4, 4

Table 27. Other reasons for leasing rights
Percent of Respondents (number)

Underestimated effects **13% (3)** ● Did not think any of this would happen ● Hoping there wouldn't be much impact ● We were ignorant, we trusted them. A mistake on our part!	Income **21.7% (5)** ● Extra income, no drilling occurring at the time ● Help pay taxes ● Income for estate ● To pay the taxes ● Lease or get no up front money
Pressure from industry **13% (3)** ● Gas Co [illegible] ● Gas Co. had complete control ● If not leased BOGC will force pool & pay penalty charged	Out of respondent's control **47.8% (11)** ● Don't own minerals ● I did not lease the minerals ● Leased by prev. Owner ● Other owner ● Multi-mineral ownership ● Parents died ● People who leased are dead. Don't know their motive. I did not lease mineral rights. ● State leased these min. ● We didn't lease it out ● We do not have a full mineral interest. Other parties with mineral interest in the same land would be leasing. We could not stop development on our surface or on state and BLM surface that we lease ● With drilling practices our participation without a ¼ a would not make any diff. So decided to go on and at least get something
Other **4.3% (1)** ● Long story	

LAND USE ABILITY

In general, the majority (79%) of respondents say that drilling has not affected the ability for them to use their land (see Table 28). North Dakota has the highest rate of individuals who report that development has affected their land at 37%, and Wyoming has the lowest at 8.2%.

Respondents were more likely though to report that oil and gas development had affected their land use ability if they had oil and gas infrastructure on their property. Nearly 97% of those who *did not* have oil and gas infrastructure on their property said that there were no effects on land use ability, compared to 68.4% of those who *did* have infrastructure on their property (see Table 29).

Table 28. Oil/gas development and effects on land use ability
Percent of Respondents (number)

	No	Yes
North Dakota	62.5% (30)	37.5% (18)
Montana	81.3% (39)	18.7% (9)
Wyoming	91.8% (56)	8.2% (5)
Pennsylvania	77.6% (52)	22.4% (15)
Total	79% (177)	21% (47)

Frequency Missing= 18

Table 29. Affected ability to use land vs. infrastructure on property
Percent of Respondents (number)

	No effects on land use ability	Affected land use ability
No infrastructure	96.5% (82)	3.5% (3)
Infrastructure on property	68.4% (95)	31.7% (44)

Frequency Missing= 18

It appears that of all types of oil and gas infrastructure found on landowners property, those with water disposal sites on their property had the highest rate of respondents (47.8%) who said that oil and gas development affected their ability to use their land (see Table 30). Not far behind

were those who had oil or gas well pads on their properties, at 46.1%. Those with oil or gas wells, pipelines, or water disposal sites all had between 35-38% of respondents say that their land use ability was affected by oil and gas development. Only 15.8% of respondents with compressor stations on their land reported that their land use ability was affected.

Table 30. Affected land use ability by types of oil/gas infrastructure
Select all that apply
Percent of Respondents (number)

	Oil/gas wells	Oil/gas well pads	Compressor station	Water gathering site	Water disposal site	Oil/gas pipeline
Unaffected land use ability	64.8% (70)	53.9% (48)	84.2% (18)	62.5% (15)	52.2% (12)	64.4% (74)
Affected land use ability	35.2% (38)	46.1% (41)	15.8% (3)	37.5% (9)	47.8% (11)	35.7% (41)

Frequency Missing= 18

All respondents that had changed their main agricultural product within the last ten years said that their land use ability was unaffected by oil and gas development (see Table 31). Of those whose main agricultural product did not change, 69% said that their ability to use their land was unaffected, and 31% said that their ability to use their land *was* affected by oil and gas development.

Table 31. Affected ability to use land by change in farmland
Percent of Respondents (number)

	No change	Change
Unaffected land use ability	69% (40)	100% (7)
Affected land use ability	31% (18)	0% (0)

Frequency Missing= 31

Regardless of a landowner's current, main agricultural product, respondents were more likely to report having their land use ability unaffected by oil or gas development than affected. One hundred percent of those who reported animal specialities as their current, main agricultural product said that their land use ability was unaffected by oil or gas development, as well as 80% of those reported field crops as their main product, 75% of those reporting beef, 75% of those reporting cash grains, and 71.4% of those reporting dairy (see Table 32). Even two thirds of respondents who said that they did not have a current, main agricultural product (providing more than 50% of their farm operations gross sales) said that their land use ability was unaffected. Although, 50% of people reporting other livestock and 50% of people reported other animal

products as their main agricultural products said that their land use ability was affected by oil or gas development.

Table 32. Affected land use ability by current main agricultural product
Percent of Respondents (number)

	Dairy	Beef	Other livestock	Cash grains	Field crops	Animal specialties	Other animal products	None	Total
Unaffected land use ability	71.4% (5)	75% (27)	50% (2)	75% (9)	80% (4)	100% (3)	50% (2)	66.7% (2)	73% (54)
Affected land use ability	28.6% (2)	25% (9)	50% (2)	25% (3)	20% (1)	0% (0)	50% (2)	33.3% (1)	27% (20)
Total	9.5% (7)	49% (36)	5.4% (4)	16.2% (12)	6.8% (5)	4.1% (3)	5.4% (4)	4.1% (3)	74

Frequency Missing= 22

For the most part, similar patterns occurred when respondents main agricultural products 10 years ago were compared to their perceptions in their land use abilities due to oil or gas development. At least two thirds of people who reported dairy, beef, cash grains, field crops, animal specialities, other animal products, or none as their main agricultural products 10 years ago said that their land use ability was unaffected due to oil or gas development (see Table 33). On the other hand, 100% of people who had other livestock as their main product 10 years ago said that their land use ability was affected.

Table 33. Affected land use ability by main agricultural product 10 years ago
Percent of Respondents (number)

	Dairy	Beef	Other livestock	Cash grains	Field crops	Animal specialties	Other animal products	None	Total
Unaffected land use ability	71.4% (5)	70.6% (24)	0% (0)	81.8% (9)	75% (3)	100% (2)	66.7% (4)	66.7% (2)	74.2% (49)
Affected land use ability	28.6% (2)	29.4% (10)	100% (1)	18.2% (2)	25% (1)	0% (0)	33.3% (2)	33.3% (1)	28.8% (19)
Total	10.6% (7)	51.5% (34)	1.5% (1)	16.7% (11)	6.1% (4)	3% (2)	9.1% (6)	4.5% (3)	66

Frequency Missing= 28

Landowners were more likely to claim that their land use ability was affected by oil or gas development if they also reported that they or someone in their household farms, such as for an occupation, to supplement household income or food, or other reasons. About 30% of people who did report someone in their household farming said their land use ability was affected,

compared to 13.3% of people who do not have someone in their household farming (see Table 34).

Table 34. Affected land use ability by household members farming occupations
Percent of Respondents (number)

	No farming occupations	Household farming occupations
Unaffected land use ability	86.7% (104)	69.6% (64)
Affected land use ability	13.3% (16)	30.4% (28)

Frequency Missing= 30

Of those who said that oil or gas developed has affected their ability to use their land, the majority claimed only 1-10% of their land was affected. Nineteen percent said 11-50% and only 2.4% said 51-99% was affected (see Table 35). However, 14.3% of all respondents said that 100% of their land was affected by oil and gas development. The most that land was affected was 100% of it, the least amount was 1%.

In Wyoming, 40% claimed that 100% of their land was affected by oil/gas development, compared to Pennsylvania and North Dakota where only 7.1% of respondents from each state (who said their land use was affected by oil/gas development) claimed 100%. North Dakota had the highest percent of individuals report the least amount of land affected, with 78.6% claiming 1-10% of land was affected. In both Montana and Pennsylvania, approximately 65% of people reported 1-10% of land was affected.

Table 35. Percent of land affected
Percent of Respondents (number)

	1-10%	11-50%	51-99%	100%
North Dakota	78.6% (11)	14.3% (2)	0% (0)	7.1% (1)
Montana	66.7% (6)	11.1% (1)	0% (0)	22.2% (2)
Wyoming	20% (1)	20% (1)	20% (1)	40% (2)
Pennsylvania	64.5% (9)	28.6% (4)	0% (0)	7.1% (1)
Total	64.3% (27)	19% (8)	2.4% (1)	14.3% (6)

Frequency Missing= 5

Across all respondents who claimed land use ability was affected by oil and gas development, the average number of months that owned land was affected was 23 (just under 2 years). The maximum number of months reported was 120 (10 years) and the minimum was four months.

The majority said that their land was affected for 6-12 months (61.9%) (see Table 36). After that, 14.3% reported 13-24 months, and 9.5% reported more than four years.

When asked whether or not the effects of oil and gas development on the land that they owned were permanent, nearly 82% across all four states said yes (see Table 37). In Wyoming, only 50% of people said the effect was permanent, compared to North Dakota, Montana, and Pennsylvania where in each state, about 78-88% of respondents said that oil and gas development had a permanent effect on their land.

More than half (65.1%) of these respondents claimed that their earnings were affected when their property was affected by oil and gas activity taking place on their land (see Table 38). In North Dakota and Pennsylvania, about 53% said yes and about 47% said no. In Wyoming, 75% said yes, and in Montana, 100% of people claimed that their earnings were affected by oil and gas activity on the land that they owned.

Table 36. Number of months land was affected
Percent of Respondents (number)

	<6	6-12 (1 yr.)	13-24 (2 yr.)	25-36 (3 yr.)	37-48 (4 yr.)	More than 4 years
North Dakota	0% (0)	57.1% (4)	14.3% (1)	14.3% (1)	0% (0)	14.3% (1)
Montana	0% (0)	66.7% (4)	16.7% (1)	0% (0)	16.7% (1)	0% (0)
Wyoming	0% (0)	33.3% (1)	33.3% (1)	0% (0)	0% (0)	33.3% (1)
Pennsylvania	20% (1)	80% (4)	0% (0)	0% (0)	0% (0)	0% (0)
Total	4.8% (1)	61.9% (13)	14.3% (3)	4.8% (1)	4.8% (1)	9.5% (2)

Frequency Missing=26

Table 37. Were effects permanent?
Percent of Respondents (number)

	No	Yes
North Dakota	12.5% (2)	87.5% (14)
Montana	22.2% (2)	77.8% (7)
Wyoming	50% (2)	50% (2)
Pennsylvania	13.3% (2)	86.7% (13)
Total	18.2% (8)	81.8% (36)

Frequency Missing= 3

Table 38. Earnings affected by property Percent of Respondents (number)		
	No	Yes
North Dakota	46.7% (7)	53.3% (8)
Montana	0% (0)	100% (9)
Wyoming	25% (1)	75% (3)
Pennsylvania	46.7% (7)	53.3% (8)
Total	34.9% (15)	65.1% (28)

Frequency Missing= 4

Of those who said that oil and gas development affected their ability to use their land and that the restriction affected their earnings from the property, more than half (57.1%) of the reported effects on earnings were related to reduced activity and/or production on their land (see Table 39). Almost 40% of the listed effects were related to finances, such as direct changes in rents or income, and about 7% were other types of restrictions, like "an annoying inconvenience".

Table 39. Type of effect on earnings
Percent of Respondents (number)

Reduced production/activity **57.1% (16)**	Financial **39.3% (11)**
● 12 acres are out of surface crop production for 25+ years. Oil & gas production has increased income* ● Less crop ● Oil well sites have reduced acres that could be planted thus reducing crops harvested. Pipelines construction has reduced the quality of the land thus reducing crop yields ● Unable to crop area, so no stable crop or hay ● Unable to grow crops ● Lessens development options. Decreases grazing ● No grazing, etc.; loss hunting, loss of vehicle-accident; runoff pollution ● Could not plant some fields or parts of fields ● Crop loss felt, pasture land affected, animals affected	● Had to adjust rent ● Lost CREP contract income for +-.5 acre ● Rent paid to me based upon acres tilled ● Surface damage payments added about $100,000 per year for 6 years ● 2 years of income @ $400 per acre-$4000 loss on just the one well ● It costs money and time to try to make the land productive again ● Some oil companies do not pay a yearly rent so no income off the land. Some do. ● We have annual payment $1,000 and we have one time $9,000-$5,000 ● We reduced the annual ranch lease payment paid to us by renters because of the extra time they needed to handle the effects of the coalbed methane natural gas activity and actions

• It can no longer be farmed • Less hay • Salt caused a loss of production • Was hay/crop field and pasture • Loss of grassland • Lost farming land • On pasture land	• 12 acres are out of surface crop production for 25+ years. Oil & gas production has increased income* • Increasing income
Other **7.1% (2)** • Mostly an annoying inconvenience • Timber	

Of those who said that oil or gas development had affected their ability to use their land, 46.2% said the net effect on their earnings was between $0 and $4,999 (see Table 40). On the other end, 7.7% said the net effect on their earnings was more than $500,000. In Wyoming, 50% of landowners who had their land use ability affected said that the net effect was more than $500,000 and 50% said it was between $10,000 and $99,999. In North Dakota and in Montana, no one reported the net effect on earnings being greater than $99,999, and the majority in both states said it was between $0 and $4,999. In Pennsylvania, results varied but 50% of respondents claimed the net effect on earnings was between $5,000 and $9,999.

Table 40. Net effect on earnings
Percent of Respondents (number)

	$0-$4,999	$5,000-$9,999	$10K- $99K	$100K-$500K	>$500K
North Dakota	66.7% (2)	0% (0)	33.3% (1)	0% (0)	0% (0)
Montana	75% (3)	0% (0)	25% (1)	0% (0)	0% (0)
Wyoming	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)
Pennsylvania	25% (1)	50% (2)	0% (0)	25% (1)	0% (0)
Total	46.2% (6)	15.4% (2)	23.1% (3)	7.7% (1)	7.7% (1)

Frequency Missing= 15

Out of all those who said that oil or gas development had affected their ability to use their land, the majority (78.6%) said that 1-25% of their land was affected (see Table 41). About 17% said that 76-100% of their land was affected and about 5% said that 26-50% was affected. No one reported that 51-75% of their land was affected by oil and gas development. For the most part, the individual states followed the same pattern. In North Dakota, Montana, and Pennsylvania, the majority reported 1-25%, followed by those who reported 76-100%, and then 26-50% (except in North Dakota where 7.1% reported 76-100% and 7.1% reported 26-50%, and in

Pennsylvania where no one reported 26-50%). In Wyoming though, 60% of landowners said that 76-100% of their land was affected.

Table 41. Percent of land affected by oil/gas development
Percent of Respondents (number)

	1-25%	26-50%	51-75%	76-100%
North Dakota	85.7% (12)	7.1% (1)	0% (0)	7.1% (1)
Montana	77.8% (7)	0% (0)	0% (0)	22.2% (2)
Wyoming	20% (1)	20% (1)	0% (0)	60% (3)
Pennsylvania	92.9% (13)	0% (0)	0% (0)	7.1% (1)
Total	78.6% (33)	4.8% (2)	0% (0)	16.7% (7)

Frequency Missing= 5

Overall, 62% of respondents said that there were positive effects of oil and gas development on their farming operations, 42.7% said there were negative effects, and 20.8% said that there were both positive and negative impacts (see Table 42). Wyoming had the highest rate of respondents report a positive impact at 76%, followed by Montana at 60%, North Dakota at 55%, and Pennsylvania at 54.6%. Correspondingly, Wyoming had the lowest rate of respondents report a negative impact at 32%, but also had the highest percent of people report there being both positive and negative impacts on their farming operations (24%).

Table 42. Impact on farming
Select all that apply
Percent of Respondents (number)

	Positive impact	Negative impact	Both positive and negative impact
North Dakota	55% (11)	42.9% (9)	19.1% (4)
Montana	60% (15)	57.1% (16)	21.4% (6)
Wyoming	76% (19)	32% (8)	24% (6)
Pennsylvania	54.6% (12)	36.4% (8)	18.2% (4)
Total	62% (57)	42.7% (41)	20.8% (20)

Frequency Missing= 4, 0, 0

Of those who said that their ability to use their land was affected by oil and gas development, more than half (60.4%) said that between 1-25% of their land area was affected (see Table 43).

About twenty percent said 0% was affected, and 11% said that 100% was affected. By state, North Dakota had the highest rate of landowners who said that 100% of their land was affected (20%) and the lowest rate of landowners who said that 0% of their land was affected (10%). The remaining seventy percent of respondents from North Dakota said that 1-25% was affected. Pennsylvania had the highest rate of respondents who said that none of their land was affected by oil and gas development in Tioga county at 30%, though there were also 10% that said 100% of their land was affected. In Montana and especially in Wyoming, responses varied. The majority of respondents in each state said that 1-25% of their land was affected.

Table 43. Percent of farmland affected by oil/gas infrastructure
Percent of Respondents (number)

	0%	1-25%	26-50%	51-75%	76-99%	100%
North Dakota	10% (2)	70% (14)	0% (0)	0% (0)	0% (0)	20% (4)
Montana	22.2% (6)	66.7% (18)	3.7% (1)	0% (0)	0% (0)	7.4% (2)
Wyoming	20.8% (5)	58.3% (14)	4.2% (1)	4.2% (1)	4.2% (1)	8.3% (2)
Pennsylvania	30% (6)	45% (9)	5% (1)	10% (2)	0% (0)	10% (2)
Total	20.9% (19)	60.4% (55)	3.3% (3)	3.3% (3)	1.1% (1)	11% (10)

Frequency Missing= 5

Of those who said that oil and gas development activity *did not* affect their ability to use their land, nearly 70% reported overall positive impacts of oil or gas activity, compared to about 27% who reported negative impacts overall, and 17.2% who reported both positive and negative impacts (see Table 44). Though those respondents who did have their land use ability affected by oil and gas development were more likely to report negative overall impacts (78.6%) and less likely to report positive overall impacts (44%).

Table 44. Impact on farming by land use ability
Select all that apply
Percent of Respondents (number)

	Positive impact	Negative impact	Both positive and negative impact
Unaffected land use ability	69.8% (44)	26.6% (17)	17.2% (11)
Affected land use ability	44% (11)	78.6% (22)	28.6% (8)

Frequency Missing= 8, 4, 4

Households with higher annual incomes in the year 2015 were more likely to report a positive impact on farming from oil or gas development then a negative impact. About 46% of respondents who reported a household income of $200,000 or more said that oil and gas development activities in their counties had a positive impact on their farming operation, compared with 27.8% who said there was a negative impact (see Table 45). Similarly, 81.7% of those who had a household income between $100,000 and $199,999 said there was a positive impact on their farming operation, compared with 32.1% who said there was a negative impact. The results though are more split when looking at respondents who reported a household income between $50,000 and $99,999. In that case, 52.5% said there was a positive impact and 53.2% said there was a negative impact. Half of households that reported an annual income of less than $10,000 in the year 2015 said that there was a negative impact on their farming operation due to oil or gas development activities, and none reported a positive impact.

Table 45. Impact on farming by household income
Select all that apply
Percent of Respondents (number)

Household income	Positive impact	Negative impact
<$10K	0% (0)	50% (3)
$10K- $49K	65.6% (18)	44.2% (12)
$50K- $99K	52.5% (13)	53.2% (14)
$100K- $199K	81.7% (17)	32.1% (7)
>$200K	45.7% (16)	27.8% (10)
Total	34.8% (64)	24.5% (46)

Frequency Missing= 58, 54

STRATEGIES VI

ADAPTATION STRATEGIES

For the most part, respondents reported that they did not change their farm or land management practices. Montana had the highest percent of respondents who did change their practices (44.4%) and Pennsylvania had the lowest (22.7%) (see Table 46). When asked to describe the changes in farm or land management practices that landowners with farming activity made as a result of oil or gas development, most cited effects and changes related to water and irrigation.

Landowners that changed their farm or land management practices though, as a result of oil or gas development, were more likely to report having their land use ability affected by oil or gas development. In fact, they were 46% more likely to do so than people who did not change their farm or land management practices (see Table 47).

Table 46. Changing practices
Percent of Respondents (number)

	No	Yes
North Dakota	76.2% (16)	23.8% (5)
Montana	55.6% (15)	44.4% (12)
Wyoming	68% (17)	32% (8)
Pennsylvania	77.3% (17)	22.7% (5)
Total	68.4% (65)	31.6% (30)

Frequency Missing= 1

Table 47. Impact on farming practices by land use ability Percent of Respondents (number)		
	No change in farm/land management practices	Changed farm/land management practices
Unaffected land use ability	83.9% (52)	37.9% (11)
Affected ability to use land	16.1% (10)	62.1% (18)

Frequency Missing= 5

About 64% of all respondents that said they changed their farm or land management practices as a result of oil or gas development, claimed that they did not work work or receive feedback from anyone when doing so (see Table 48). About 35% of all respondents said that they worked with or received feedback from family members, 31% consulted with lawyers, and 17.9% consulted with the oil and gas industry itself. Approximately 10% of all respondents worked with "other" sources of feedback such as contractors, or in Wyoming, the Powder River Basin Resource Council. The least popular entities that respondents worked with were business consultants and local government at 3.6% each.

On a state level, Pennsylvania had the highest rate of respondents who did not consult with anyone when changing their practices, at 80% followed by North Dakota at 75%, then Montana at 58.3%, and Wyoming at 57.1%. No one in Pennsylvania however consulted family members, but 50% of people in North Dakota and 50% of people in Montana did. In Wyoming, 50% of respondents consulted with lawyers, and 37.5% worked with other sources of feedback.

Table 48. Feedback for changing practices *Select all that apply* Percent of Respondents (number)					
	North Dakota	Montana	Wyoming	Pennsylvania	Total
No one- did it myself	75% (3)	58.3% (7)	57.1% (4)	80% (4)	64.3% (18)
Family members	50% (2)	50% (6)	25% (2)	0% (0)	34.5% (10)
Business consultant	0% (0)	8.3% (1)	0% (0)	0% (0)	3.6% (1)
Financial manager	0% (0)	16.7% (2)	0% (0)	20% (1)	10.7% (3)
Local business association	0% (0)	8.3% (1)	0% (0)	0% (0)	3.6% (1)
Oil/gas industry	0% (0)	25% (3)	14.3% (1)	20% (1)	17.9% (5)
Lawyer	25% (1)	25% (3)	50% (4)	20% (1)	31% (9)
Extension educator or specialist	20% (1)	8.3% (1)	12.5% (1)	20% (1)	13.3% (4)
Conservation District	0% (0)	8.3% (1)	0% (0)	20% (1)	7.1% (2)
Local government	25% (1)	0% (0)	0% (0)	0% (0)	3.6% (1)
Other	0% (0)	0% (0)	37.5% (3)	0% (0)	10.3% (3)

Frequency Missing= 2, 1, 2, 2, 2, 2, 1, 0, 2, 2, 1

One hundred percent of respondents who worked with or received feedback from a business consultant when changing their farm or ranch management practices due to oil or gas development, said that their ability to use the land that they own was unaffected by oil and gas development (see Table 49). On the other hand, 100% of landowners that worked with or received feedback from a local business association, extension, a conservation district, or their local government said that their ability to use their land was affected by oil or gas development. The majority of all landowners (except for the one who spoke with a business consultant) had their land use ability affected by oil and gas development, regardless of who they consulted with when changing their farm or ranch management practices.

Table 49. Sources of feedback vs. affected land use ability Percent of Respondents (number)		
	Unaffected land use ability	Affected land use ability
No one, I did it myself	38.9% (7)	61.1% (11)
Family	33.3% (3)	66.7% (6)
Business consultant	100% (1)	0% (0)
Financial manager	33.3% (1)	66.7% (2)
Local business association	0% (0)	100% (1)
Oil/gas industry	40% (2)	60% (3)
Lawyer	22.2% (2)	77.8% (7)
Extension	0% (0)	100% (4)
Conservation district	0% (0)	100% (2)
Local government	0% (0)	100% (1)
Other	33.3% (1)	66.7% (2)

Frequency Missing= 3, 2, 3, 3, 3, 3, 2, 1, 3, 3, 2

During the peak of oil and gas activity in each county, on average landowners spend nearly 6 hours monitoring activity on their land. The maximum number of hours spent a week monitoring was 99 and the lowest was zero. In fact, 42.9% of all respondents reported spending no hours a week monitoring oil and gas activity on their land. Forty-six percent of all respondents reported 1-10 hours, 9.8% reported 11-50 hours, and only 1.2% reported spending more than 50 hours a week monitoring activity on their land during the peak of oil and gas development in their counties. Wyoming had the highest rate of landowners claiming they spent 0 hours monitoring activity during the peak of oil and gas development at 51%, followed by Pennsylvania at 44.7%, Montana at 44.4%, and North Dakota at 30%. In North Dakota, Montana, and Pennsylvania, most people spent between 1-10 hours monitoring activity, although there were also respondents that reported spending between 11-50 hours in each of the four states. No one in North Dakota or Montana spent more than 50 hours monitoring activity each week, but 2.6% in Pennsylvania and 2% in Wyoming did so.

Currently (post-peak), the average number of hours spent monitoring activity on owned land was .9. The maximum number of hours spent was 20 and the minimum was zero. Approximately 64% of respondents overall said that they currently spend no hours a week monitoring oil and gas activity on their land. About 35% spend 1-10 hours and 1.2% spend 11-

50 hours. No respondents currently spend more than 50 hours a week monitoring activity on their land. In North Dakota, about 43% spend zero hours monitoring, about 52% spend between 1-10 hours, and 5% spend between 11-50 hours. In Montana, respondents are split between spending zero hours a week monitoring (51%) and spending 1-10 hours a week monitoring (49%). In Wyoming though, 77% more of respondents spend zero hours monitoring than 1-10 hours, and in Pennsylvania, two thirds of respondents spend zero hours monitoring and one third spend 1-10 hours.

Table 50. Hours spent monitoring activity
Percent of Respondents (number)

	During peak				**Currently**			
	0	1-10	11-50	>50	0	1-10	11-50	>50
North Dakota	30% (12)	62.5% (25)	7.5% (3)	0% (0)	42.5% (17)	52.5% (21)	5% (2)	0% (0)
Montana	44.4% (16)	50% (18)	5.6% (2)	0% (0)	51.4% (19)	48.6% (18)	0% (0)	0% (0)
Wyoming	51% (25)	28.6% (14)	18.4% (9)	2% (1)	88.5% (46)	11.5% (6)	0% (0)	0% (0)
Pennsylvania	44.7% (17)	47.4% (18)	5.3% (2)	2.6% (1)	66.7% (22)	33.3% (11)	0% (0)	0% (0)
Total	**42.9% (70)**	**46% (75)**	**9.8% (16)**	**1.2% (2)**	**64.2% (104)**	**34.6% (56)**	**1.2% (2)**	**0% (0)**

Frequency Missing= 79 Frequency Missing= 80

LEASES/BONUSES/ROYALTIES

Approximately 80% of respondents claimed receiving lease or bonus payments or royalties from the land that they owned (see Table 51). North Dakota had the highest rate of individuals receiving payment (93.9%) and Wyoming had the lowest rate (57.4%).

The amount of payment received per acre varied among value. The most respondents reported getting $50-$300 per acre (29.9%) followed by $301-$1,000 per acre (23.9%) (see Table 52). Approximately 21% reported getting $1,001-$2,500 per acre. On the other hand, 15.4% of people only received $1-$49 per acre, and 10.3% got more than $2,500 per acre. Landowners in Wyoming were by far the most likely to make the least amount of lease and/or bonus payment per acre, with 43.5% claiming they received $1-$49 per acre, and 30.4% claiming $50-

$300 per acre. Pennsylvania had the highest rate of landowners that received lease or bonus payment get more than $2,500 per acre with about 15% claiming such. The lowest rate of landowners making more than $2,500 per acre was in Montana where only 5% did.

Table 51. Payments and royalties
Percent of Respondents (number)

	No	Yes
North Dakota	6.1% (3)	93.9% (46)
Montana	22.9% (11)	77.1% (37)
Wyoming	42.6% (26)	57.4% (35)
Pennsylvania	11.4% (8)	88.6% (62)
Total	21.1% (48)	78.9% (180)

Frequency Missing= 14

Table 52. Payment per acre
Percent of Respondents (number)

	$1- $49	$50- $300	$301- $1,000	$1,001- $2,500	More than $2,500
North Dakota	7.4% (2)	37% (10)	29.6% (8)	18.5% (5)	7.4% (2)
Montana	10% (2)	30% (6)	30% (6)	25% (5)	5% (1)
Wyoming	43.5% (10)	30.4% (7)	8.7% (2)	8.7% (2)	8.7% (2)
Pennsylvania	8.5% (4)	25.5% (12)	25.5% (12)	25.5% (12)	14.9% (7)
Total	15.4% (18)	29.9% (35)	23.9% (28)	20.5% (24)	10.3% (12)

Frequency Missing= 63

The approximate amount of royalty income received by landowners and/or someone in their household varies among amount and by state. Overall, the most common amount received was less than $10,000 (18.5%), followed closely by over $500,000 (17.9%) (see Table 53). About 15% of all respondents reported receiving no royalty income on their land since leasing their rights.

Landowners from North Dakota were most likely to have the highest amount of income from royalty, with 35.1% reporting over $500,000, followed by Montana where 21.2% reported over $500,000 in royalty income. Wyoming and Pennsylvania had much lower rates of higher incomes, and higher rates of lower incomes. In Wyoming, 20.6% made no royalty income, and

20.6% made less than $10,000. Similarly in Pennsylvania, 22.4% made no royalty income and 29.3% made less than $10,000.

Table 53. Royalty Income
Percent of Respondents (number)

	North Dakota	Montana	Wyoming	Pennsylvania	Total
0	2.7% (1)	9.1% (3)	20.6% (7)	22.4% (13)	14.8% (24)
<$10K	5.4% (2)	12.1% (4)	20.6% (7)	29.3% (17)	18.5% (30)
$10K- $24K	5.4% (2)	9.1% (3)	8.8% (3)	10.3% (6)	8.6% (14)
$25K- $49K	8.1% (3)	6.1% (2)	5.9% (2)	6.9% (4)	6.8% (11)
$50K- $99K	16.2% (6)	18.2% (6)	17.7% (6)	3.5% (2)	12.3% (20)
$100K- $249K	18.9% (7)	24.2% (8)	8.8% (3)	6.9% (4)	13.6% (22)
$250K- $499K	8.1% (3)	0% (0)	8.8% (3)	10.3% (6)	7.4% (12)
>$500K	35.1% (13)	21.2% (7)	8.8% (3)	10.3% (6)	17.9% (29)

Frequency Missing= 18

The different types of spending from royalty payments were super grouped into the following categories:

1. Home/family needs
    a. Purchased a new car or truck
    b. Vacation, travel, or entertainment
    c. Donated to charity
    d. College or other educational expenses
    e. Home repairs/improvements
2. Savings
    a. Saved or invested for retirement
    b. Saved for other future needs
    c. Other estate planning
3. Farm expenses
    a. Repairs to or new construction of farm-related buildings
    b. Purchased new farm machinery or equipment
    c. Otherwise invested in the farm
    d. Purchased more farmland
    e. Started a new farm enterprise
4. Started, expanded, or improved an existing non-farm business
    a. Started a non-farm business

b. Expanded or improved an existing non-farm business
5. Other

Across all landowners that reported receiving royalty payments, the most common types of spending from those payments were home/family needs and savings (each at 66.7%) (see Table 54). More than half of all respondents (53%) reported spending royalty payments on various farm expenses, about 14% spent on other things, and nearly 5% spent on another non-farm business.

In North Dakota, home/family needs was the most common type of spending from royalty payments at 82.6%, followed by savings (73.9%), farm expenses (56.5%), non-farm business (8.7%), and other (6.5%). Montana followed a similar pattern except that 23.5% of landowners spent royalty payments on other uses. In Wyoming, savings was the most common type of spending at 64.9%, followed by farm expenses (54.1%), home/family needs (46%), and other (13.5%). No one in Wyoming reported spending money from royalty payments on a non-farm business. In Pennsylvania, 60.8% of landowners reported spending royalty payments on both home/family needs and savings, followed by farm expenses at 47.1%, other at 13.7%, and non-farm business at 2%.

Table 54. Spending from royalty payments
Select all that apply
Percent of Respondents (number)

	North Dakota	Montana	Wyoming	Pennsylvania	Total
Home/family needs	82.6% (38)	76.5% (26)	46% (17)	60.8% (31)	66.7% (112)
Savings	73.9% (34)	67.7% (23)	64.9% (24)	60.8% (31)	66.7% (112)
Farm expenses	56.5% (26)	55.9% (19)	54.1% (20)	47.1% (24)	53% (89)
Non-farm business	8.7% (4)	8.8% (3)	0% (0)	2% (1)	4.8% (8)
Other	6.5% (3)	23.5% (8)	13.5% (5)	13.7% (7)	13.7% (23)

Frequency Missing= 74

The majority of all respondents (75.9%) said that they or someone in their household did not work with a financial advisor to help manage the leasing/royalty income (see Table 55). This was the case in every state as well, although North Dakota had the highest rate of landowners who said that they or someone in their household did work with a financial advisor at 45.2%. Wyoming had the lowest rate of landowners who said yes at about 9%.

Table 55. Financial advising Percent of Respondents (number)		
	No	Yes
North Dakota	54.8% (23)	45.2% (19)
Montana	72.2% (26)	27.8% (10)
Wyoming	91.2% (31)	8.8% (3)
Pennsylvania	83.9% (52)	16.1% (10)
Total	75.9% (132)	24.1% (42)

Frequency Missing= 6

Forty percent of all respondents that said they or someone in their household was working with a financial advisor to help manage the lease/royalty income reported that they were working with a financial planner, specifically, and nearly 30% said that they were working with a broker. About 11% claimed to be working with a friend or family member that was a financial advisor, and nearly 30% said they worked with some other type of financial advisor. Some of the "other" types of financial advisors that respondents made note of were accountants, attorneys, the bank, tax man, a professional land manager, and a wealth management firm. In Wyoming and in Pennsylvania, no one worked with a friend or family as a financial advisor, but in North Dakota almost 19% did so. Also, no one in Wyoming worked with a financial planner, but 61.1% did in North Dakota, 30% did in Montana, and 22.2% did in Pennsylvania.

Table 56. Type of financial advisor Percent of Respondents (number)				
	Friend/family	Broker	Financial planner	Other
North Dakota	18.8% (3)	35.3% (6)	61.1% (11)	6.3% (1)
Montana	10% (1)	30% (3)	30% (3)	30% (3)
Wyoming	0% (0)	33.3% (1)	0% (0)	0% (0)
Pennsylvania	0% (0)	11.1% (1)	22.2% (2)	70% (7)
Total	10.5% (4)	28.2% (11)	40% (16)	28.2% (11)

Frequency Missing= 4, 3, 2, 3

COSTS/BENEFITS

The most common types of benefits from oil and gas development cited by respondents were related to finances and economic stimulus, as well as significant infrastructure improvement. Among the former, respondents listed perks such as monthly payments from royalties or surface damage settlements, paying off loans and debt, early retirements, and gaining a sense of financial security as a result of their involvement with local oil and gas development. Financial benefits allowed for investment into farm or ranch improvements, which in turn heightened the value of the properties. Higher taxes also led to an increase in property value, and some landowners reported liquidizing their land assets as a benefit.

On a macro scale, the oil and gas industry stimulated the local economies through a deeper tax base and more employment opportunities for young people to return home to after college. Local shops and retail entities saw an increase in business from the oil and gas "boom" in their counties. Higher taxes also led to improvements in county schools and parks.

Additionally, many respondents reported better roads and infrastructure on or near their property, such as water, electricity, and fences. Although traffic from the oil and gas industry was noted as a small issue, overall road improvements and maintenance were significant. Water from gas wells was utilized as cleaning water for some landowners, and abandoned wells were sometimes converted into domestic wells.

One respondent simply replied "It has made life more interesting" when asked to describe the benefits from oil and gas development. Another said "None. I wish they had not come here. I hate them" and many others said that there were no benefits they or someone in their household experienced as a result of oil and gas development.

When asked to describe costs that respondents or someone in their household had experienced as a result of oil and gas development in their counties, some of the most common costs cited were significantly higher income and property taxes, higher cost of living and living expenses, and legal fees associated with dealing with the oil and gas companies. Many landowners also said that time, stress and headaches were a major cost for themselves and their families.

Although water infrastructure and better water was listed as a benefit for some respondents, others said that water quality and convenience was a cost that they experienced, as well as needing more irrigation equipment and noxious weed spray than normal. Several respondents claimed broken windshields and vehicle damage from flying rocks exacerbated by the

heightened truck traffic from the oil and gas industry. Other costs listed were higher crime, the installation of security systems, outsiders coming into the community, having strangers on property and in livestock which in some cases, led to broken gates and cattle guards that needed to be repaired.

There also seemed to be a series lack of reclamation of land used for well sites and pipeline routes that led to landowners needing labor, equipment, and fuel to fix the damages. In some cases there was tree loss, degradation to the landscape and scenery, land loss, crop loss, and an overall devaluation in property value because of proximity to oil and gas infrastructure.

WELFARE

In total, 47.4% of all respondents said that they and the members of their households were better off as a result of the oil and gas development in their counties (see Table 57). About 19% said that they were a little better off,16.4% said that they were about the same, 11.3% said they were worse off, and 5.6% said that they were a little worse off. North Dakota had the highest rate of respondents who reported that they and their families were better off (67.4%), and the lowest rate of respondents who reported that they and their families were worse off (4.1%). Montana had the highest rate of people who said that they were worse off at 15.6%, followed closely by Pennsylvania with 15.4%. Pennsylvania also had 29.2% of respondents say that they and their families were better off from oil and gas development, which was significantly lower than each of the other 3 states. In Wyoming, responses varied, but 44.4% said that they were better off, and 24.1% said that they and their families were about the same. In general though, landowners seemed to feel more positively about the overall effects of oil and gas development on they and their families than negatively.

Table 57. Overall effects on family
Percent of Respondents (number)

	Worse off	Little worse off	About the same	Little better off	Better off
North Dakota	4.1% (2)	4.1% (2)	4.1% (2)	20.4% (10)	67.4% (33)
Montana	15.6% (7)	4.4% (2)	11.1% (5)	13.3% (6)	55.6% (25)
Wyoming	9.3% (5)	7.4% (4)	24.1% (13)	14.8% (8)	44.4% (24)
Pennsylvania	15.4% (10)	6.2% (4)	23.1% (15)	26.2% (17)	29.2% (19)
Total	11.3% (24)	5.6% (12)	16.4% (35)	19.3% (41)	47.4% (101)

Frequency Missing= 29

Households with a high amount of annual income were likely to report being overall better off from oil and gas development in their counties. Nearly 78% of households that earned in more

than $200,000 in a year said that they were better off, and only 2.8% said they were worse off (see Table 58). Further, about 63% of households that earned between $150,000 and $199,999 in a year said they were better off, and no one said that they were worse off. As level of household income goes down, the rates at which respondents reported being worse off start to increase; forty percent of households earning less than $10,000 a year claimed being worse off from oil and gas development in their counties.

Table 58. Overall effects on family by household income
Percent of Respondents (number)

	Worse off	Little worse off	About the same	Little better off	Better off
<$10K	40% (2)	0% (0)	20% (1)	0% (0)	40% (2)
$10K- $24K	15.8% (3)	10.5% (2)	26.3% (5)	26.3% (5)	21.1% (4)
$25K- $49K	15.2% (5)	9.1% (3)	24.2% (8)	9.1% (3)	42.4% (14)
$50K- $74K	16.7% (5)	6.7% (2)	13.3% (4)	33.3% (10)	30% (9)
$75K- $99K	15.4% (2)	0% (0)	7.7% (1)	23.1% (3)	53.9% (7)
$100K- $149K	4.6% (1)	0% (0)	18.2% (4)	27.3% (6)	50% (11)
$150K- $199K	0% (0)	5.3% (1)	10.5% (2)	21.1% (4)	63.2% (12)
>$200K	2.8% (1)	5.6% (2)	8.3% (3)	5.6% (2)	77.8% (28)

Frequency Missing= 65

Over half of all respondents (54.1%) said that their county was better off as a result of oil and gas development. After that, 21.3% said that their county was a little better off, 11.6% said it was worse off, 7.7% said it was about the same, and 5.3% said that it was a little worse off. In all four states, the most respondents reported that their county was better off. Montana had the highest rate of respondents report that their county was better off with 65.9%, and Pennsylvania had the lowest with 44.4%. Correspondingly, Pennsylvania had the highest rate of people say that their county was worse off due to oil and gas development at 15.9%, and Montana had the lowest at 4.6%. Similarly to the overall results, the next most popular answer in each of the four states (after “better off”) was that the counties were a little better off due to oil and gas development. Almost 12% of respondents in Wyoming, 9% in Montana, 8% in Pennsylvania, and 2% in North Dakota said that their county was about the same as a result of oil and gas development in their counties.

Table 59. Overall effects on county Percent of Respondents (number)					
	Worse off	Little worse off	About the same	Little better off	Better off
North Dakota	14.6% (7)	2.1% (1)	2.1% (1)	20.8% (10)	60.4% (29)
Montana	4.6% (2)	9.1% (4)	9.1% (4)	11.4% (5)	65.9% (29)
Wyoming	9.6% (5)	3.9% (2)	11.5% (6)	25% (13)	50% (26)
Pennsylvania	15.9% (10)	6.4% (4)	7.9% (5)	25.4% (16)	44.4% (28)
Total	11.6% (24)	5.3% (11)	7.7% (16)	21.3% (44)	54.1% (112)

Frequency Missing= 35

There does not appear to be much difference between the ways in which respondents perceived the overall effects of oil and gas development on their households versus their counties as a whole. Again, households with higher annual incomes ($75,000 to $200,000 or more) were more likely to report their counties being better off from oil and gas development than those households earning less than $75,000 per year (see Table 60). Households earning between $10,000 and $74,000 annually though were still more likely to report their counties being better off or a little better off than being a little worse off or worse off. Forty percent of households earning less than $10,000 a year said that their counties were worse off from oil and gas development.

Table 60. Overall effects on county by household income Percent of Respondents (number)					
	Worse off	Little worse off	About the same	Little better off	Better off
<$10,000	40% (2)	0% (0)	20% (1)	20% (1)	20% (1)
$10K- $24K	11.1% (2)	11.1% (2)	0% (0)	50% (9)	27.8% (5)
$25K- $49K	10% (3)	6.7% (2)	13.3% (4)	20% (6)	50% (15)
$50K- $74K	13.8% (4)	6.9% (2)	13.8% (4)	24.1% (7)	41.4% (12)
$75K- $99K	14.3% (2)	0% (0)	0% (0)	7.1% (1)	78.6% (11)
$100K- $149K	18.2% (4)	4.6% (1)	9.1% (2)	9.1% (2)	59.1% (13)
$150K- $199K	0% (0)	5.6% (1)	11.1% (2)	11.1% (2)	72.2% (13)
>$200K	10.5% (4)	2.6% (1)	2.6% (1)	21.1% (8)	63.2% (24)

Frequency Missing= 68

IMPLICATIONS VII

The purpose of this survey was to identify the effects that unconventional oil and gas drilling had on landowners in various counties and the ways in which those individuals tried to mitigate and manage the impacts of said development

CHARACTERISTICS OF RURAL LANDOWNERS NEAR OIL AND GAS WELLS

Energy development affects a broad range of rural landowners with respect to age, income, occupation and land use. The respondents to this survey lived on holdings ranging from less than 10 to over 3000 acres. One-third had owned the land since prior to 1960, one-third acquired their land between 1961 and 1990, and the remaining one-third were newcomers since 1991. Our survey respondents were overwhelmingly male (72%) and over half of them were over the age of 50.

This survey provides a reminder that some rural landowners who own land near oil and gas activity are not involved in agriculture. Only 44% of the respondents reported working as farmers or ranchers. Among this cohort, about half reported beef cattle as their main agricultural product. Other important products were dairy (41.2% of Pennsylvania farm/ag respondents); cash grains and field crops. 1 in 10 respondents in the survey resides in a different county or state from the property targeted in this survey, with the greatest amount in North Dakota (19.2% of respondents).

The oil and gas footprint on private land in rural areas is uneven. Only 64% of the survey's responding landowners had wells, pipelines or other oil and gas infrastructure on their land (the other 36% were within 1,000 feet of a well by survey design). Respondents also demonstrate a wide variety in the duration of the property's association with oil and gas activity. 44% of the respondents reported that mineral leasing involving their property dated to prior to 1960, with 10% reporting it occurring since 2009—and the remainder distributed between 1960 and 2009. This distribution was fairly similar across the counties. Answers to questions about why landowners leased suggest that most did it for the income (76%) and that many also hoped it would not affect their own use of the land (41%).

PERCEPTIONS OF COSTS AND BENEFITS

Two-thirds the respondents to this survey reported a positive impact of oil and gas development on themselves and their counties and three-quarters said that their county was better off. These endorsements of oil and gas impacts should be recognized alongside those who reported no

change in well-being at the family (16%) or county (8%) scale, and those who felt they and their families and county were worse off (17%).

The most common benefits reported in open-ended answers related to finances and the local economic stimulus. In addition, respondents reported benefiting from improvements made to road, electricity and water infrastructure on their properties. Some of the most common costs cited were significantly higher income and property taxes, higher cost of living and living expenses, and legal fees associated with dealing with the oil and gas companies. Many landowners also said that time, stress and headaches were a major cost for themselves and their families.

The responses to this survey did not endorse a perspective that oil and gas development precludes other rural land use activities or that it is changing agriculture directly in terms of products or farming/ranching activity. But the experience of costs and benefits is mixed: Overall, 62% of respondents said that there were positive effects of oil and gas development on their farming operations, 42.7% said there were negative effects, and 20.8% said that there were both positive and negative impacts.

In fact, the majority of farming and ranching respondents said that drilling has not affected the ability for them to use their land, although that proportion was less (68%) if the respondent had infrastructure on his/her land. For those reporting impacts to land use, when asked whether or not the effects of oil and gas development on the land that they owned were permanent, nearly 82% across all four states said yes.

Among 43 respondents who said the effect on their operation had negative effects on earnings, the majority reported lost production with lost rent being the other prominent concern.

Ownership of and benefits from mineral leases was also uneven, with 41% of respondents claiming they had full ownership of the minerals associated with their land and 43% reporting a mix of ownership involving the surface owner and other private parties. 25% of respondents in Wyoming were surface owners above federally-owned mineral estate. Payments, including royalties, bonus payments or surface damage agreements, varied widely in their amount. 19% of respondents reported receiving under $10,000 in total from royalty income, while another 18% reported receiving over $500,000 in total.

ADAPTATION & INVESTMENT STRATEGIES

Landowners, including farm and ranch operators, largely adapted to oil and gas impacts (both positive and negative) in an individualistic manner. More than half spent time monitoring oil and gas activity on their land during the peak of development. Among those who reported having to respond to oil and gas activity with changes in farm and ranch practices, the majority did not consult with outside expertise.

Across all landowners that reported receiving royalty payments, the most common types of spending from those payments were home/family needs and savings (each at 66.7%). More than half of all respondents (53%) reported spending royalty payments on various farm expenses, about 14% spent on other things, and nearly 5% spent on another non-farm business. The majority of all respondents (75.9%) said that they or someone in their household did not work with a financial advisor to help manage the leasing/royalty income.