NEW MEXICO RANCHING AND ITS FUTURE

Final report presented to the Thornburg Foundation

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EXECUTIVE SUMMARY

The ranching industry is a vital economic component of the New Mexico economy and an important piece of the social and historical fabric of its people. Ranchers encounter many challenges and are influenced by unpredictable environmental and economic conditions, an uncertain future of the livelihood, and changes in public land use and tax burdens. In addition to the current challenges, New Mexico is known for its diversity in people and landscape, which is why there is a need for greater information on the current perceptions and economic motivators within the ranching community. Towards that end, the results from a survey of New Mexican ranchers presented in this report help characterize and identify rancher demographics and range land activities currently found throughout the state. Further, we explore the choices and motivations of land management practices, perceptions on the future of ranching, and ranch economic diversification. Results were obtained using the Taylor Mixed-Method survey design yielding 487 valid responses of New Mexico ranchers.

Results support the idea that ranching demographics in New Mexico are quite diverse. While dominantly male and 55 years or older, there is greater diversity racially, ethnically, and in educational attainment. Ranch characteristics vary widely in size and number of livestock, as well as in management practices. However, the importance of family did not change significantly throughout the state. Indeed, the family unit is a critical component of ranching; the family supplies most ranch labor, and a majority of ranchers (70%) have been in the lifestyle for over 60 years.

Results also show that land management practices are highly variable. Grazing practices employed by ranchers are dominated by simple rotational and continuous schemes. However, a holistic management approach is utilized by 28% of the respondents, indicating that it helps improve rangeland productivity, resilience, and profitability. Most people not using holistic management believed it would not work on their ranch or were unfamiliar with the practices.

We also found that many factors influence land management decisions. First, higher income ranches, those that make more than $20,000 in net revenue annually, tend to be larger in size and operation and employ simple rotational and holistic management grazing schemes more frequently than lower income ranches, those that make less than $20,000 in net revenue annually, suggesting a return to higher input practices. Second, public land use also impacts land management. Ranchers who use public land for some amount of grazing tend to use simple

rotational and holistic management, and control for invasive species and brush encroachment more often than ranchers who use private land only. While the relationship between public and private land use remains unclear, our results do suggest that a spillover effect exists across land types. Finally, ranchers' perspectives and experience with drought relates to management practices. Ranchers who indicated that they had changed their land management in response to drought more frequently tend to use simple rotational and holistic grazing schemes more and tend to place more effort in controlling invasive species and brush encroachment than those ranchers that did not alter their management styles in the face of drought. Interestingly, most ranchers surveyed said that they do not use any irrigation, which makes unpredictable rain patterns more trying. Given that this survey provides a general overview of ranchers in New Mexico, we encourage further studies to tease out the directionality and causation behind some of the aforementioned relationships.

Land management practices are just one input into a rancher's economics returns. What the rancher does with the cattle and alternative uses for the land also affect profit. Not surprisingly, a majority of ranchers in our survey did indicate that they produce conventional livestock and sell at local livestock auctions. However, ranchers will widely admit to uncertain economic returns, which is why some ranchers try different techniques to improve their profit, such as to certify their livestock and use different marketing methods. Some ranches have also turned to hunting and outfitting services along with tourism activities and crop production to supplement income. Many ranchers, generally those earning below $20,000 net revenue annually, have outside employment, which constitutes a large proportion of their annual income.

The economic returns on a ranch will certainly affect the future of ranching. As our results indicate, the future of ranching, as perceived by ranchers themselves, appears to be a bit uncertain. Approximately 56% believe that it is at least somewhat likely the younger generation will take over the ranch. The remaining ranchers may either sell their operation, do not have any plans currently, or simply do not plan on retiring. Overall, keeping the land as a functioning ranch and in the family is important, especially to those that have no plans on retiring. Even though ranchers are continuing the heritage of their ranch and the lifestyle in general, they are very cautious about entering into any agreements such as conservation easements as a means to this end.

The purpose of this study is to attempt to understand the current characteristics, motivations, outlooks, and incentives of New Mexico ranchers and to provide insight as to how land managers respond to both the economic and environmental conditions of the region. Our results consistently highlight the diversity and uncertainty within the ranching industry and lifestyle, which is why any simple one-dimensional policy may have limited impact statewide. Policy should be direct with particular goals in mind. To help the industry, policy should help reduce the uncertainty faced by ranchers and promote alternative economic activities. Such policies can address easing the certification of livestock, encouraging alternative on-ranch activities, reducing uncertainty around public lands and taxation, and informing the public about different management styles and land preservation options.

PART I: SUMMARY BACKGROUND AND PURPOSE

Cattle ranching in New Mexico has developed over many years, beginning with the first cattle drive north to Colorado and Montana in 1866 (Merlan 2010). Since then, the livestock industry has become an integral component of New Mexico's economy, adding close to $2.5 billion to the state's gross state product and employing over 32,000 workers in 2012 (Diemer, Crawford, and Patrick 2014). While not unique to New Mexico, ranching is facing many new and old challenges. For example, uncertain and unpredictable precipitation, drought, invasive species, volatile livestock and input markets, wildlife interaction, disease, conservation groups, and family legacies are all part of the environment in which ranchers work. Rangeland operations are also under pressure from external sources. Agencies such as U.S. Forest Service (USFS) and Bureau of Land Management (BLM) are reconsidering the level of grazing allotments allowed on public lands, significantly shrinking forage area for many ranchers. Finally, proposed tax changes, although unpassed, would increase the tax burden on landowners. Not only must these concerns be balanced to ensure the sustainability of an operation, but in the face of constant uncertainty, ranchers are still attempting to provide for themselves and their family.

A key challenge ranchers face is that livestock are intense grazers with the potential to affect the environmental and ecological landscape. While ranchers have the incentive to maintain a healthy pasture, according to New Mexico agricultural extension agents, rangelands do often experience degraded land issues[1]. In fact, intense grazing in the 19th century led to a degraded landscape that is still in need of restoration (BLM 2011). With such a dynamic system, managers are constantly making decisions as to how to manage their livestock, such as considering the number of animals that graze in a particular area and how the cattle run on the land. This decision-making process becomes critical in shaping the landscape. Because of the links between drought, forage/range quality, invasive species, and wildlife, management strategies that consider these environmental factors can provide a path to maximize profits over time while also protecting the land.

[1] New Mexico ag extension agents state that land degradation is most often associated with droughts.

The demographics of New Mexico ranchers are also highly variable and are currently shifting from historical norms. The state is characterized by a diverse race, ethnicity, and educational and income profile. An aging population is further complicated by a large proportion of the succeeding generation electing not to enter into the ranching lifestyle (New Mexico Department of Agriculture 2015). The result is a situation where current landowners are uncertain about the future of their land and ranching in New Mexico.

The remainder of this report provides the results from a survey of New Mexico ranchers in the fall of 2016 where questions were asked about current land management strategies, the economic incentives driving these practices, income diversification, and perceptions about the future of ranching in New Mexico. In what follows, we describe the results from the survey that highlight the current statewide demographic patterns, land management practices used by ranchers, and ranch characteristics. From there, we attempt to understand the underlying reasons for these patterns and actions amongst ranchers. This study also explores the insecurity around the future of ranching and how land owners plan to cope with the uncertainty on a personal level. Finally, this study sets out to expand on the knowledge about ranching that exists from the continuing USDA agricultural survey and other studies that have focused on the land management practices of ranchers in other states.

PART II: SURVEY DESIGN AND STATISTICS

II.1 ADMINISTRATION AND SAMPLING PLAN

The goal of the survey was to assess the current management practices used by New Mexico ranchers, identify the economic drivers that motivate them, and gain an understanding of their opinions on the future of ranching. Towards this end, the survey was implemented and distributed to active ranchers throughout New Mexico using the Dillman et al. (2014) mixed-mode, web- and paper-based Tailored Design Method. The Dillman method provides survey participants the flexibility of filling out the survey either on paper or online and has been shown to be an effective way of increasing the response rate and reducing biases.

II.1.1 Implementation Overview

The study was implemented using the mixed-mode Tailored Design Method (Dillman et al. 2014), which is a highly accepted and standard method for developing and administering surveys. The survey was sent to 2,100 randomly selected ranchers in New Mexico. The process included the potential for four different contacts, depending on the responses of the recipients, over a six-week period (See Appendix A.1 for a description of the four steps and timeline).

The recipients were given the option of taking the survey online or on a paper based version that was provided to them. The online version of the survey was administered through Opinio, a well-established survey platform that has been chosen by the University of New Mexico (UNM) as its dedicated survey instrument and allowed for responses to be stored safely and confidentially. It is accessible by all computers and mobile devices, which provides great flexibility for respondents. The online survey was identical in form and questions to that of the paper version.

To ensure the privacy of respondents, each survey contained a random identification code that also worked as the passcode for online access. The mailing list and responses were always kept separate to help ensure anonymity. All contact was made via first class mail and included a paid return envelope to UNM for paper based survey responses.

II.1.2 Sample Selection (Population of Interest)

In total, 2,100 surveys were sent out to a random sample of ranches throughout the state of New Mexico, which is approximately 10% of the total number of ranches listed in the 2012 USDA agricultural census. Our sample was selected using a random number generator to identify 2,100 ranchers and ranches from the 2015 New Mexico Brand Book. There are pros and cons associated with using the Brand Book. While there are no readily available databases of ranches in New Mexico, the Brand Book does provide information on individuals, families, and corporations that held livestock brands that are required for transactions in New Mexico. Unfortunately, ownership of a brand does not also necessarily reflect the existence of an operating ranch as highlighted in our response rate below.

II.1.3 Design and Pretest

We thoroughly tested the questionnaire before sending out the final survey version to ensure the best instrument possible. We conducted a total of four focus groups and personal interview sessions. These sessions provided vital feedback during the initial development stage, allowing us to improve on questions and the structure of the survey. An initial pre-test of 100 surveys was then sent out to a randomly selected group of ranchers from the New Mexico Brand Book. The 100 test responses were used to identify any issues in the questionnaire, survey implementation, and sample selection. The final version of the survey was made using insights from the pre-test mailing, allowing for the administration of the main survey.

II.1.4 Responses

All returned paper responses were manually entered into the Opinio database using the unique identifier associated with each recipient. All mailed and online responses were compiled into one de-identified secure digital database that could be used for further analysis. We chose to manually process paper surveys through Opinio, versus directly into a spreadsheet or database, to help reduce any processing or entry errors. Further, manual entry of the paper surveys reduced any potential compatibility issues from exporting the data from Opinio into other formats.

II.2 SURVEY RESPONSE RATE

II.2.1 General

Table 2.1 summarizes the breakdown of the survey respondents. Overall, we had a response rate of approximately 36% which fell within the range of 30%-49% obtained by other studies that conducted surveys of ranchers in California, Wyoming, and New Mexico (Roche et al. 2015 and Thacher et al. 2010).

In total, there were 778 completed valid responses. A survey was considered valid if the respondent completed at least one of the questions. The first question of the survey was designed to qualify the participant into the desired population of interest. This first question simply asked if the survey respondent was currently ranching in New Mexico, where a 'yes' response validated the respondent into the population. If a person replied 'no' to currently being a rancher in New Mexico, then the survey was considered in the calculation of the survey response rate but was not used in further analysis. Table 2.1 shows that of the 778 valid responses, 487 surveys were completed while the other 291 stated they were not ranchers in New Mexico and ended the survey. The high number of non-ranchers was to be expected, as the population from which the sample was taken, from the New Mexico Brand Book, contains brand holders that are not necessarily active ranchers. Other factors that were taken into consideration were the mailings that were returned as undeliverable to the addressed recipient, those that were deceased, and those that refused to participate. An overwhelming majority of the responses (~95%) were completed in paper form versus online.

Table 2.1. Survey return rate statistics.

Type of Response	# of Responses
Valid Responses	
Completed	487
Non-NM Rancher	291
Total	**778**
Unreachable Recipient (Returned to sender)	**36**
Other	
Deceased	19
Refusal	3
Total	**22**
Non-returned	**1,264**
Total	**2,100**

II.2.2 Valuation Component

As mentioned previously, the survey focused on the basic demographics and management practices of ranchers in New Mexico, along with how these individuals feel about the future of their ranch. A second component attempted to assess the value ranchers placed on cultural component of ranching through a contingent valuation process. Unfortunately, the total number of responses for the valuation component was quite small at thirty-six responses. The low response prohibits greater analysis concerning the cultural component, and therefore directs attention towards the finding from the other sections, i.e. the valuation results will not be discussed below. For a basic look at the thirty-six responses, please see Appendix A.2.

PART III: Results

III.1 RESPONDENT DEMOGRAPHICS AND RANCH CHARACTERISTICS

This section provides an overview of the demographic and ranch characteristics of the respondents. This section not only provides insight into the socioeconomic makeup of the ranching community but provides verification that there was a representative sample for the state of New Mexico. Each section is organized with a brief background of the topic covered, followed by the relevant survey results.

III.1.1 Demographics

Background

The demographics of New Mexican ranchers are highly variable and are currently shifting from historical norms. There has been an increase in the number of younger ranchers and farmers, including a significant increase of those under age 34. However, overall there is still an aging trend in the community with an average rancher age of 60.5 years. Additionally, the number of minority, mainly Hispanic, operators has increased as well bringing new perspectives to ranching (New Mexico Department of Agriculture 2015).

Survey Results

The survey respondents were dominantly male (82%) with over 72% 55 years of age or older (Figures 3.1 and 3.2). While the majority of the respondents self-reported to be white (62%), Figure 3.3. shows that a quarter were Spanish/Hispanic/Latino and approximately 12% were Native Indian/Alaska Native reflecting the racially and ethnically diverse citizens of New Mexico. Finally, Figure 3.4 shows that 41% of the individuals have completed a bachelor's degree or more, while 6% do not have a high school degree or GED.

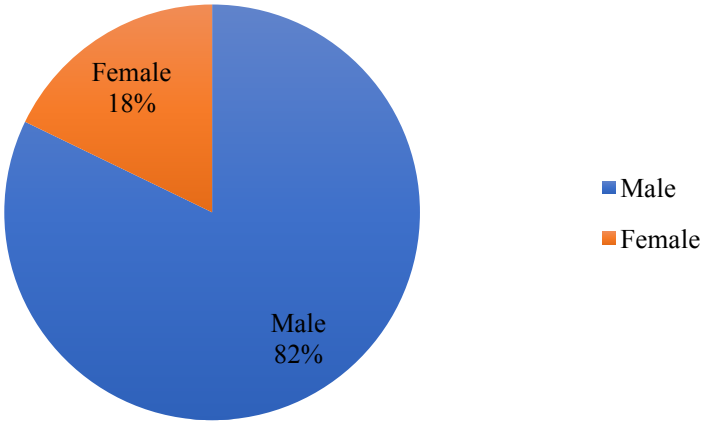

Figure 3.1. Gender breakdown of survey respondents.

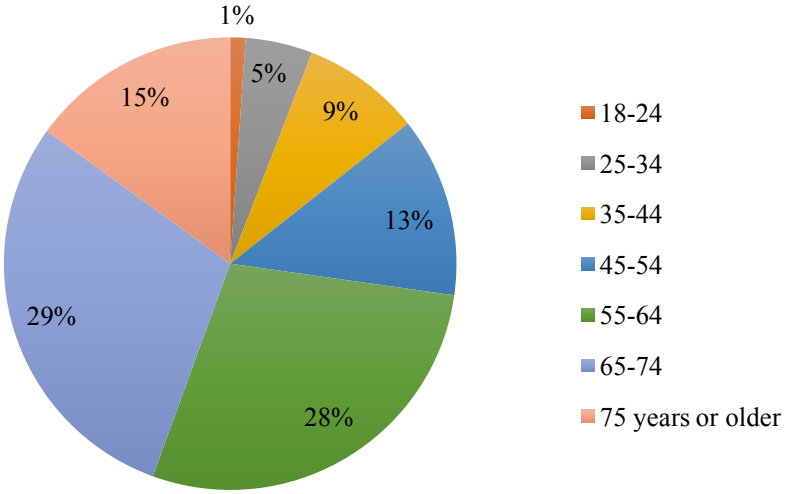

Figure 3.2. Age breakdown of survey respondents

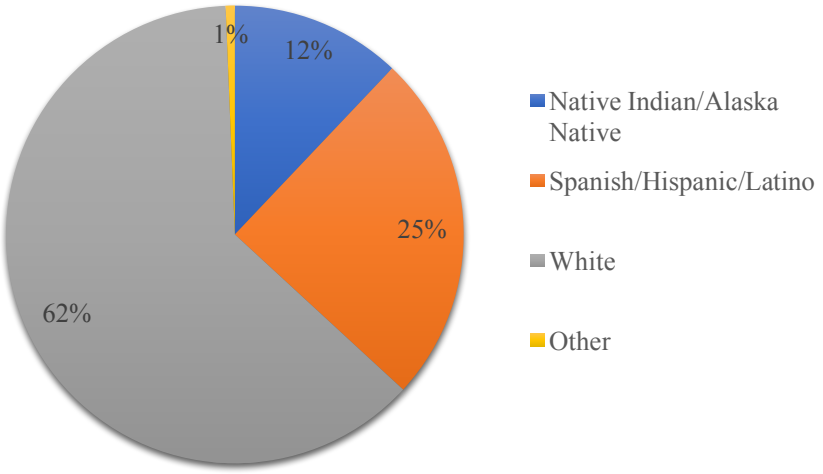

Figure 3.3. Self-reported race breakdown of survey respondents.

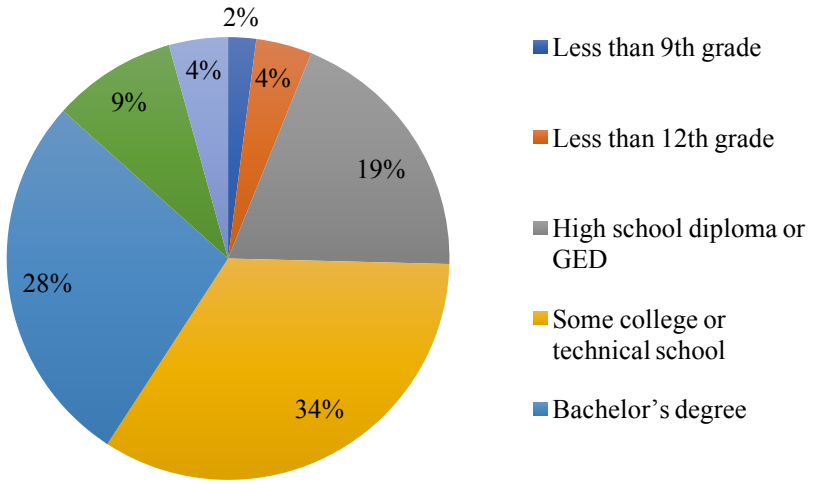

Figure 3.4. Educational achievements of survey respondents.

III.1.2 Ranch Characteristics

Background

Farms and ranches are a major user of land, covering 43.2 million acres of New Mexico's 78 million total acres, with 88% of that area identified as pastureland as shown in Figure 3.5. Approximately 24,700 farm operations across the state generate over $2.5 billion in revenue each year, with sales and products from livestock accounting for more than $1.9 billion (76% of total revenue).

Between 2007 and 2012, the number of ranches[2] in New Mexico increased with slightly more land dedicated to permanent pasture or rangeland; this contrasts with the national trend that is seeing a decline in ranch numbers. The distribution and makeup of approximately 13,890 ranching operations varies statewide (Figure 3.5). While there are ranching activities throughout the state (with the exception of Los Alamos country), there is a greater prevalence of ranches in the northern and eastern portion of the state due to pasture quality, often driven by the variability in water availability, precipitation, and soil quality. Additionally, private land ownership patterns (See Figure 3.25 in section III.7 below) dictate where land is available for grazing. It is also evident that a majority of farms (including both crop and livestock production operations) in New Mexico tend to be bimodally distributed as either small family-owned farms or large-scale operations (Figure 3.6). Cattle and calves make up a large segment of the livestock inventory of the state, at approximately 1.35 million head, followed by sheep and lambs, layers (poultry), horses and ponies, and goats respectively (Table 3.1)[3].

[2] The number of ranches increased from approximately 9,500 to 13,890. The total land area designated as pasture and rangeland increased from 39,597,641 to 39,973,029

[3] Between 2007 and 2012, the number of cattle and calves has decreased by 11.2%.

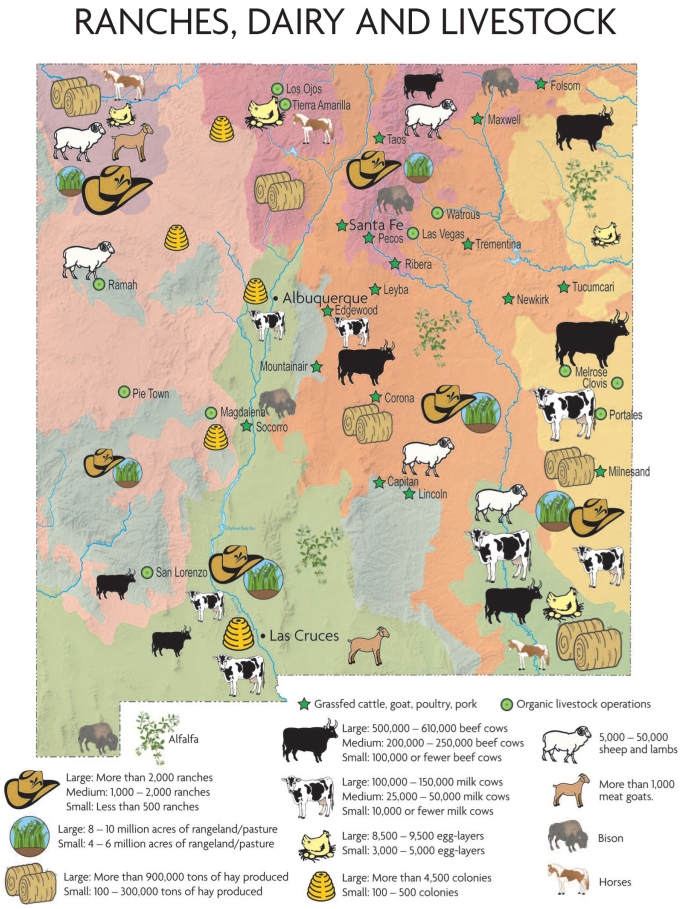

Figure 3.5. Distribution of ranches and agricultural products throughout New Mexico. (Dreaming New Mexico 2015).

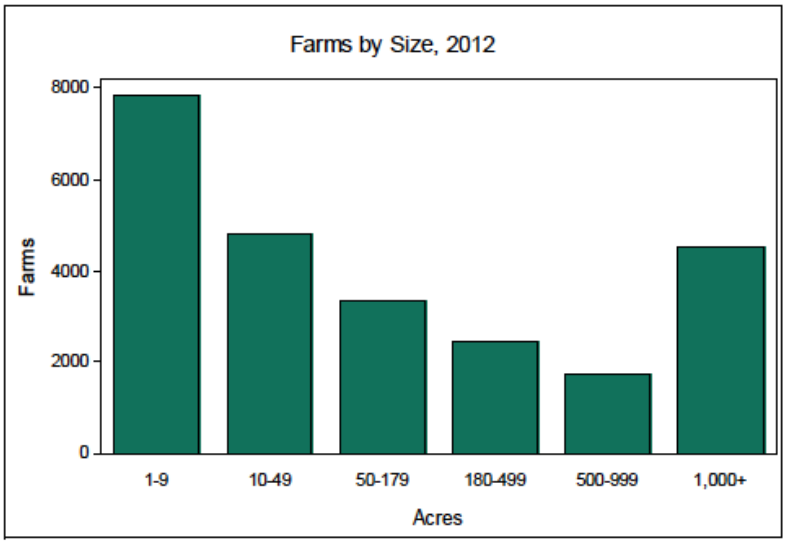

Figure 3.6. 2012 distribution of farm sizes in New Mexico from the USDA (United States Department of Agriculture 2012).

Table 3.1 2012 USDA Census of Agriculture livestock inventory for New Mexico. (USDA, 2012)

Item	# of Farms	Inventory
All cattle and calves	12, 796	1,354,240
Beef cows	11,004	461,595
Milk cows	410	318,878
Hogs and pigs	211	1,294
Sheep and lambs	3,385	89,745
Layers (Chicken)	1,768	66,653
Meat-type chickens	54	11,852

Survey Results

Survey responses were received from 32 of the 33 counties in New Mexico (Figure 3.7). As there were no ranches listed for Los Alamos county according to the USDA agricultural survey, the current study has representation throughout the entire state. Our respondent representation is especially important when considering the great diversity in landscapes and terrain found in New Mexico. Some counties were under- or overrepresented with the number of received responses, such as Dona Ana and Torrance counties, respectively. For this study, Figure 3.8 shows that there is also quite a variety in the geographic size of ranches as well, with no one size dominating. Where the distribution of ranch size from this study is fairly uniform, the USDA survey shows a bimodal distribution with very small and very large operations being most prevalent. While our results do contrast with the USDA agricultural survey, it should be noted that the USDA numbers include non-livestock farms as well. The number of cattle a ranch had at the end of 2015 was quite variable as shown in Figure 3.9. Figure 3.10 shows that, in general, most ranches do not irrigate rangeland indicating the strong dependence on precipitation. Finally, the family unit is quite important in ranching. With a long history of ranching in New Mexico, results show that almost 70% of ranches have had family in the lifestyle for over 60 years (Figure 3.11). Additionally, Figure 3.12 shows that 75% of the ranching labor is supplied by the family.

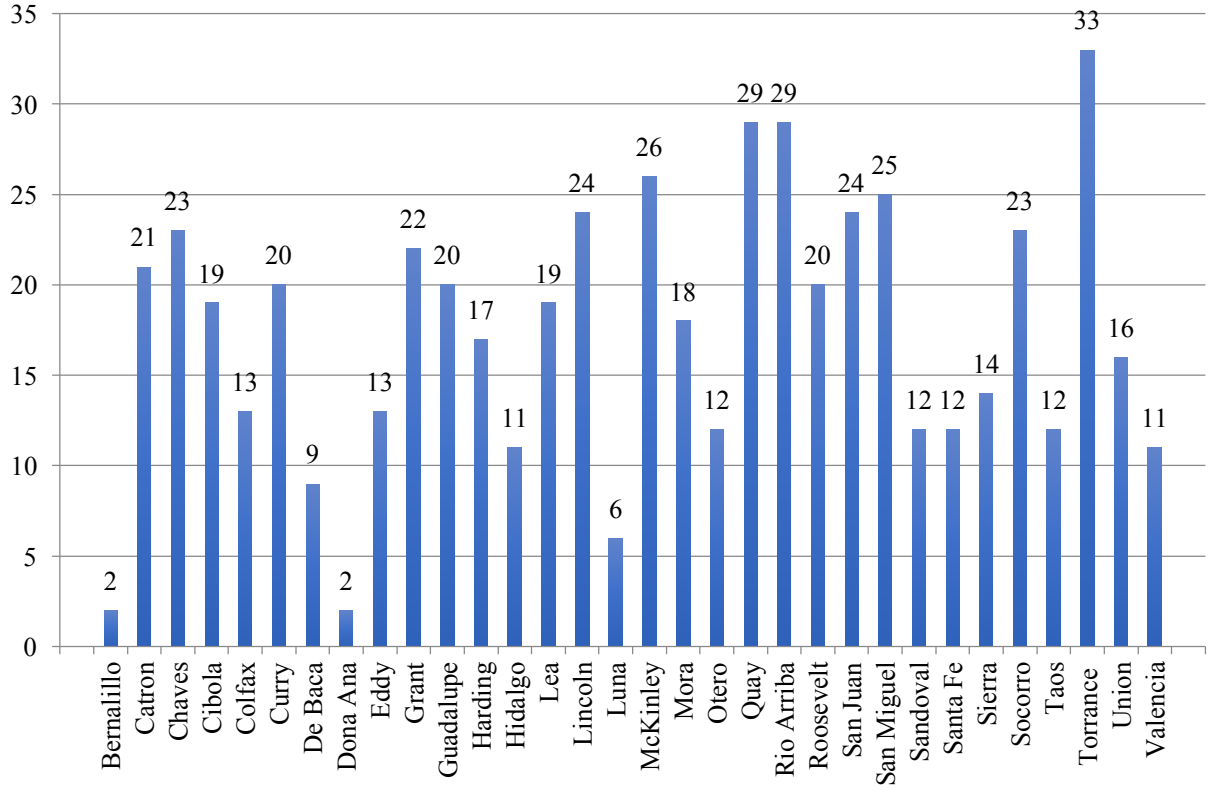

Figure 3.7. Number of surveys received from each county.

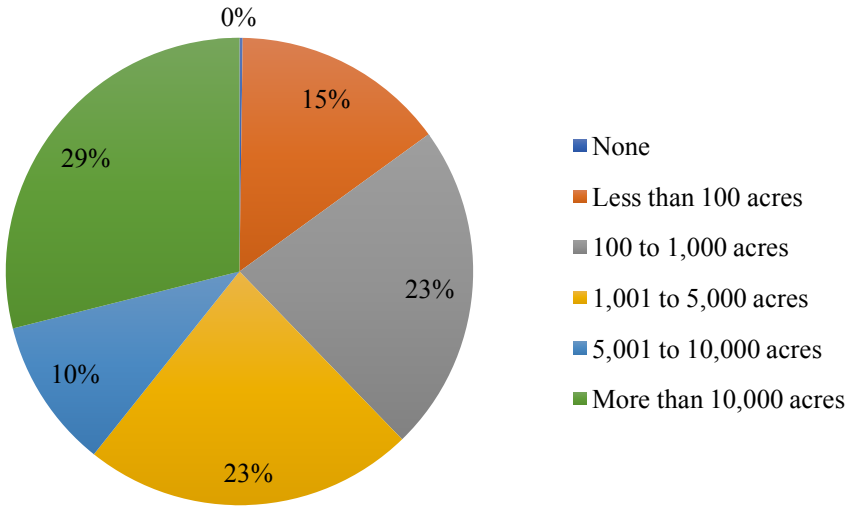

Figure 3.8. Breakdown of ranches by total acres ranched.

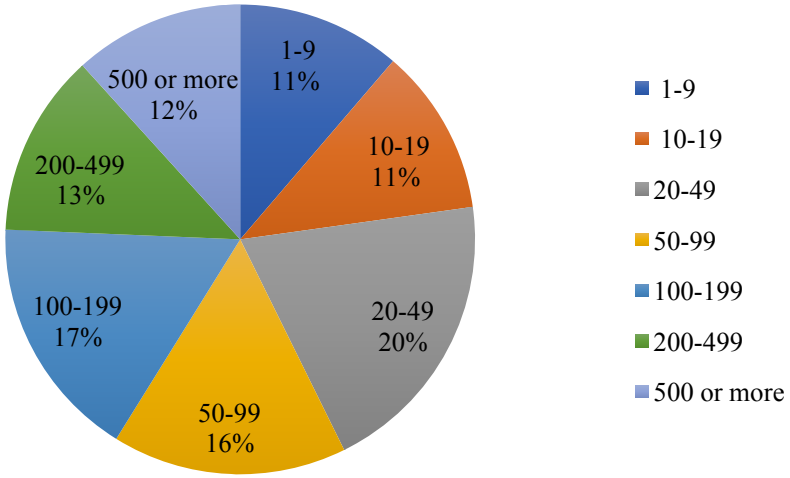

Figure 3.9. Number of livestock per ranch in 2015.

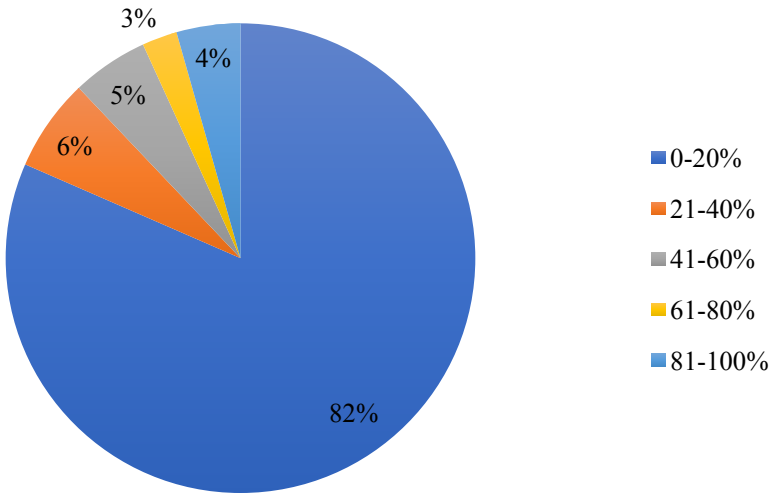

Figure 3.10. Percent of ranch that is irrigated.

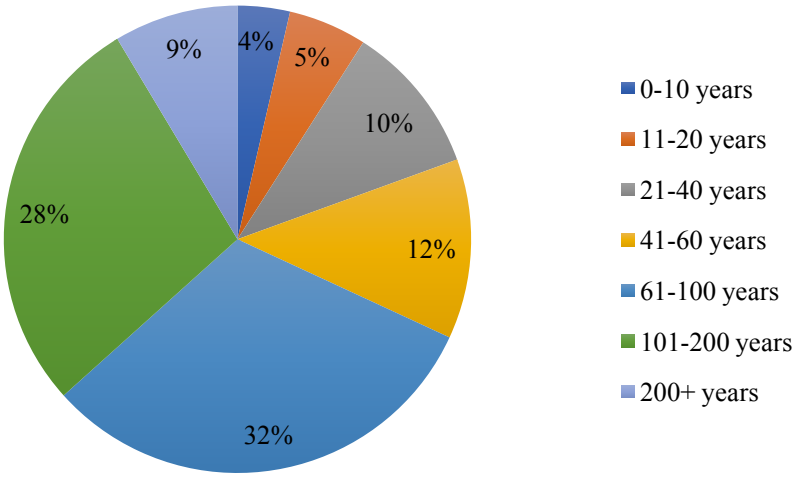

Figure 3.11. Number of years that the family has been ranching in New Mexico.

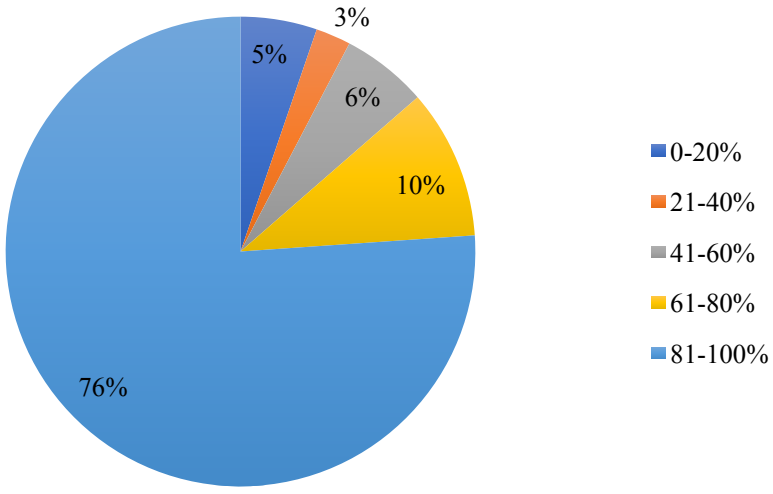

Figure 3.12. Percent of ranch labor supplied by family.

III.2 CURRENT LAND MANAGEMENT PRACTICES

Important to understanding individual motivations of ranchers is knowing how land managers currently use their land. A vital component of that management is the grazing strategies employed. Land managers must also combat other concerns such as invasive species and brush encroachment. The following section examines the current status of land management practices used in New Mexico.

Background

Ranchers respond to environmental and economic pressures when deciding how to manage their livestock and land. The diversity of the landscape throughout New Mexico can, therefore, lead to different strategies. In general, there are usually four main grazing schemes that are widely recognized and were used for the current survey (continuous, simple, intensive, holistic). Continuous is defined as a "one-pasture system where livestock have unrestricted grazing access for a long period of time." There are two types of rotational grazing schemes, simple and intensive, where livestock are rotated through several pastures to provide rest for forage between grazing. Intensive differs from simple as the pastures are smaller and grazed for shorter periods of time requiring more movement of livestock herds. Finally, holistic management is more of "a whole ranch planning system where land managers consider the relationships between plants, soil, livestock, people, and water through financial planning, grazing planning, land planning, and biological monitoring." (adapted from Holistic Management International)

In addition to grazing patterns, ranchers must decide how to deal with other rangeland issues such as invasive species and brush encroachment. Both are concerns to rangeland productivity and forage availability which can have profound impacts on livestock production. Their management can often be costly and time consuming to the land owner.

Survey Results

As the New Mexico landscape is quite diverse, it was expected that the management practices that ranchers used would vary as well. Figure 3.13 provides a summary of livestock management practices currently used throughout the state. By far the most utilized strategies were simple rotational and continuous grazing, both reflecting the lowest level of input required.

However, simple rotational management, requiring greater inputs, almost doubles that of continuous grazing suggesting that land managers balance the health of their rangelands and the amount of labor and capital that is available to them. Of note, our results differ slightly from previous work by Lubbell et al. (2013) and Roche et al. (2015), two rancher projects conducted in California and Wyoming. A majority of the ranchers in California and Wyoming chose an intensive type of rotational grazing which differs from New Mexico ranchers who mainly used a simple rotational strategy.

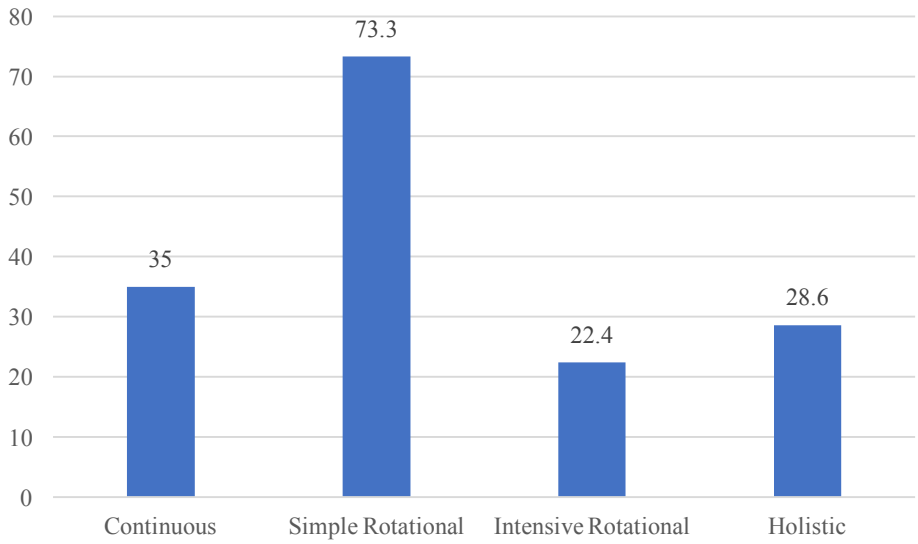

Figure 3.13. Percent of ranches using each livestock management strategy. strategy. Note that some ranches may use multiple strategies.

A holistic management system is used by approximately 28% of the respondents in New Mexico, both exclusively or in combination with other strategies. Due to its highly intensive nature it is understandable that the technique would not suit or interest all ranchers. When asked specifically why a person does not use holistic management most people did not believe it was sustainable on their ranch (Figure 3.14). Another reason is a lack of familiarity with the concept with 30% of the land managers not practicing holistic management for this reason. Other factors contribute to its lack of adoption, but only 15% actually do not believe in holistic management. Those that do practice holistic management not only find that it improves the health of their rangelands both in productivity and resilience to drought, but over 60% also

suggest it also helps the profitability of the ranch. Further, many are concerned about wildlife and feel that holistic management helps support alternative wildlife habitat (Figure 3.15).

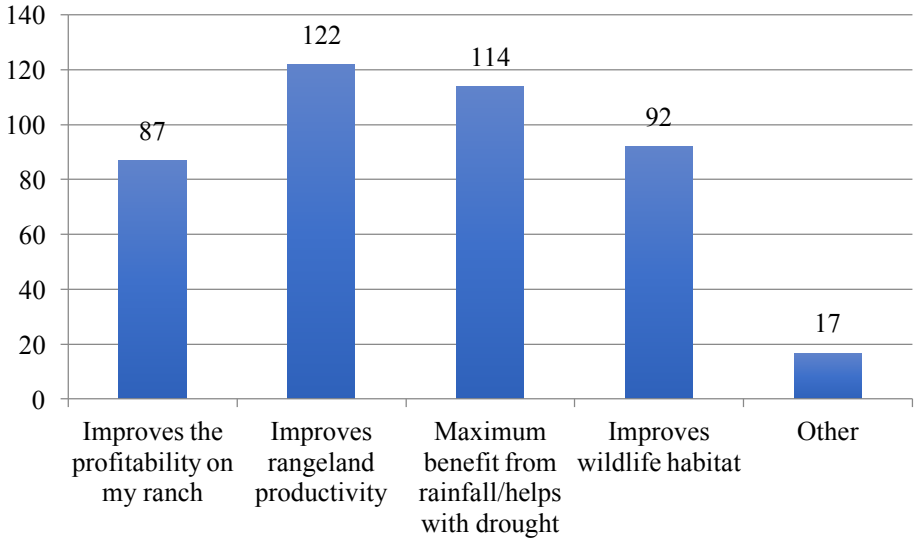

Figure 3.14. Number of responses for why holistic management was adopted.

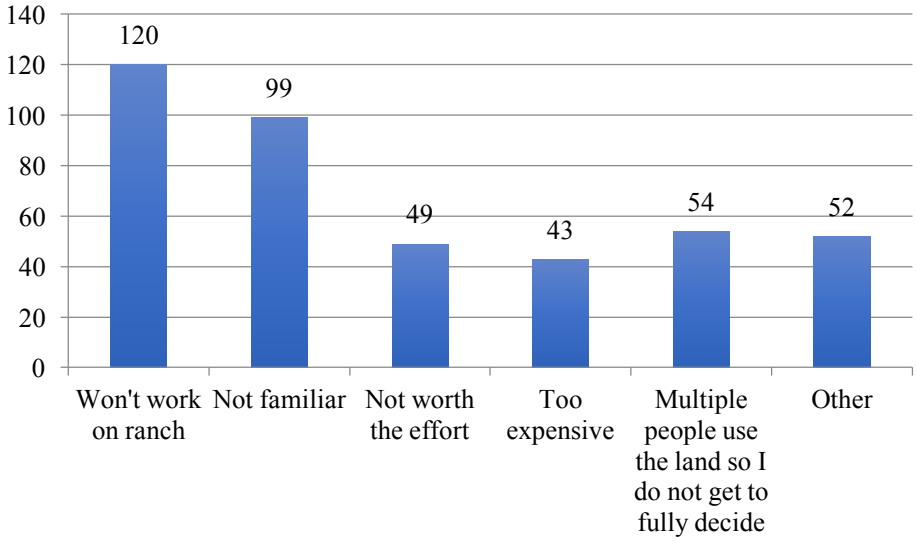

Figure 3.15. Number of responses for why holistic management was not adopted.

The concern about invasive plant species and expanding brush continues to be an issue throughout New Mexico. Mechanical or chemical control of these environmental nuisances can be both time consuming and expensive. Failure to address invasive species and brush

encroachment can lead to reduced rangeland quality and productivity. Indeed, as Figures 3.16 and 3.17 show, it does appear that ranchers recognize the consequences of inaction with at least 65% of rangeland managers addressing each of these problems. Over 50% regularly control for invasive species and brush encroachment at least every 4 or 5 years, respectively.

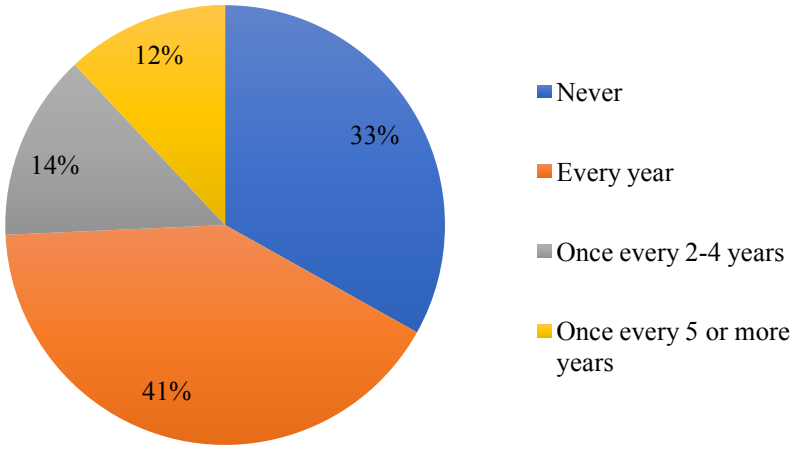

Figure 3.16. Frequency land managers control for invasive plant species.

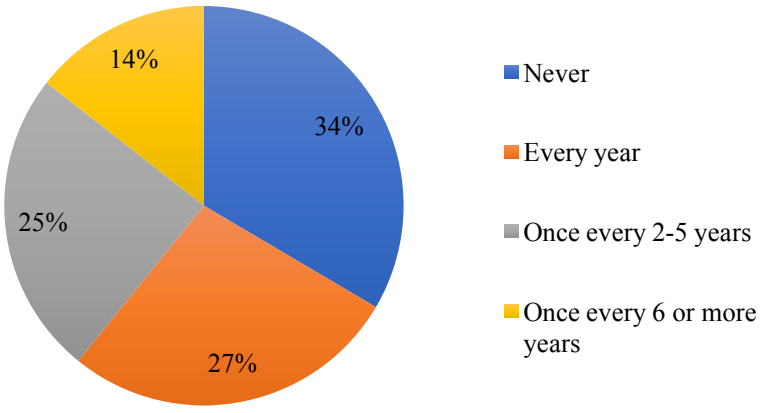

Figure 3.17. Frequency land managers control for brush encroachment.

III.3 DIVERSIFYING RANCH ACTIVITIES

Background

With over $680 million in revenue from non-dairy livestock and related products in New Mexico, ranching provides a significant opportunity for personal income, where ranching is the primary occupation of approximately half of ranch owners (United States Department of Agriculture 2012). To further enhance this income, ranchers use a variety of different marketing techniques and product differentiations through livestock certifications to help improve overall profitability. Despite the availability of agricultural insurance[4] covering a portion of unexpected losses in the ranching business, ranchers still face an unpredictable environment due to precipitation variability, diseases, and market fluctuations. To accommodate environmental and market uncertainty, ranchers have begun to diversify their activities, supplementing income and smoothing some of the volatility that is inherent in raising livestock. Activities can include fishing and wildlife activities and varieties of tourism.

Background on Wildlife and Hunting Permits

The same characteristics that make land viable for livestock also make it desirable for wildlife, especially true for large grazing animals such as elk, deer, and antelope. Although potentially competitive to livestock, land managers see an opportunity to benefit financially through hunting activities on their land. The hunting and fishing industry is a $600 million a year industry in New Mexico (Southwick Associates 2014).

Private ranches receive the majority of the state hunting license allotments (e.g. approximately 50 percent of elk hunting are dedicated to private landowners), which provides the ranch with a way to generate additional income (Gay 2015). For example, in 2005 permit values for bull elk and cow were each valued around $3,000 and $300, respectively. Buck deer permit values have ranged between $800 and $2,500. Finally, buck antelope has been known to receive up to $1,400 per permit (Torell 2010). The New Mexico Department of Game and Fish (NMDGF) has specific programs, A-PLUS and E-PLUS, which give private landowners a

[4] Agriculture and ranching insurance exists for the "part-time gentleman farmer to the full scale agribusiness around New Mexico (See Pat Campbell Insurance and Becton Insurance Company Inc. for example policies). These insurance policies cover losses related to milk contamination, equine liability, cargo, outbuildings, and beyond.

certain allotment of antelope and elk hunting permits. Private land owners can apply for hunting licenses which are supplied free of charge by the state. NMDGF determines allotment based on rangeland habitat conditions and ranch size. Therefore permits for antelope and elk range from 1 to 61 and 1 to 130 per ranch, respectively (New Mexico Department of Game and Fish 2015b; New Mexico Department of Game and Fish 2015a). Boosting revenue beyond the sales of permits to hunters, landowners are also providing outfitting services and lodging (Southwick Associates 2014). For example, a large ranch with 14 big game licenses could generate up to $25,000-$40,000 a year in revenue from hunting activities (Keates 2014).

Background on Agritoursim and Specialized Items

Agricultural areas are getting attention from people of all ages because of the rural lifestyle and natural settings. As a result, ranch and farm operations have seen an increase in visitors over recent years. This trend, known as agritourism, varies across operations and includes activities such as weddings, dude ranches, and educational classes (Wilson, Thilmany, and Sullins 2006). In the future, New Mexico ranches could potentially benefit from this $600 million growing industry (Global Center for Cultural Entrepreneurship 2015).

Additionally, as people and restaurants become more focused on buying local, sustainable, organic, and humanely raised products, ranchers (and farmers) can greatly benefit from this trend with more money staying in New Mexico. Grocery chains such as Whole Foods often offer and advertise locally (New Mexico) grown agricultural products and livestock products, while local restaurants such as Farm & Table and Vinaigrette often use locally sourced ingredients (Global Center for Cultural Entrepreneurship 2015).

Survey Results

Results shown in Figure 3.18 demonstrate that ranching enterprises traditionally focus on the production of conventional livestock. However, some ranches are finding it beneficial to diversify their product by raising livestock under specific conditions. Certifications, such as organic or free-range, allow sellers to market their livestock in a particular way resulting in higher per unit profits. While conventional livestock dominates in number, there are a variety of other products produced. Of these, grass-fed, free-range, and hormone/antibiotic free are the most popular, in that order. Certifying their products allows producers to obtain a slight premium

for their livestock over conventionally raised cattle. Interestingly, these numbers might be low as a number of respondents explained that certifications can be difficult to obtain and not worth the effort even though their livestock were raised in a particular manner.

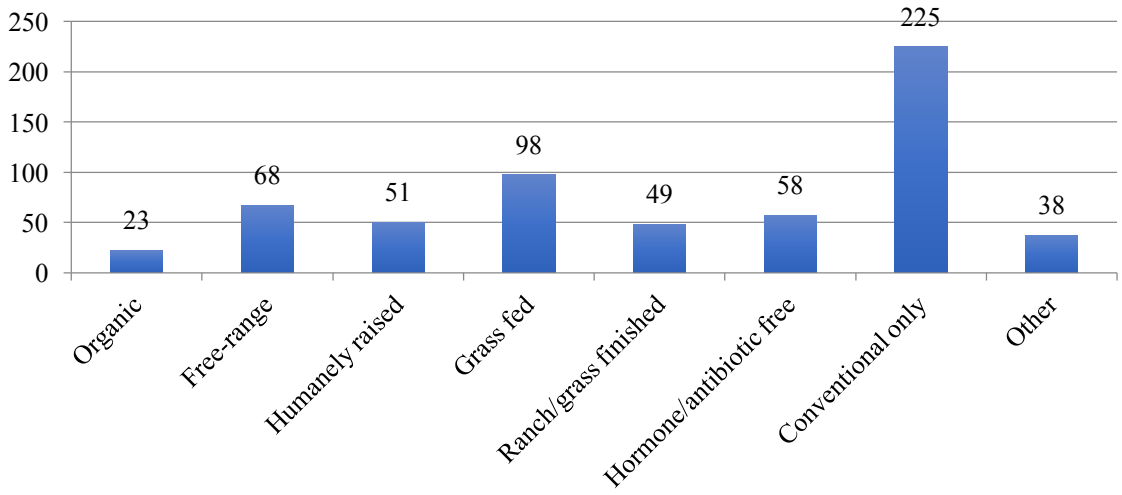

Figure 3.18. Number of ranches that are certified for each type of livestock.

As seen in Figure 3.19, results also indicate that most producers still market most of their livestock through local auctions. However, there is a growing trend of sales direct to the consumer. Over 20% of ranchers use direct sales which potentially increases the profitability for the seller and reduces the price for buyers. These trends feed into the greater demand from local restaurants and stores to provide specialized products.

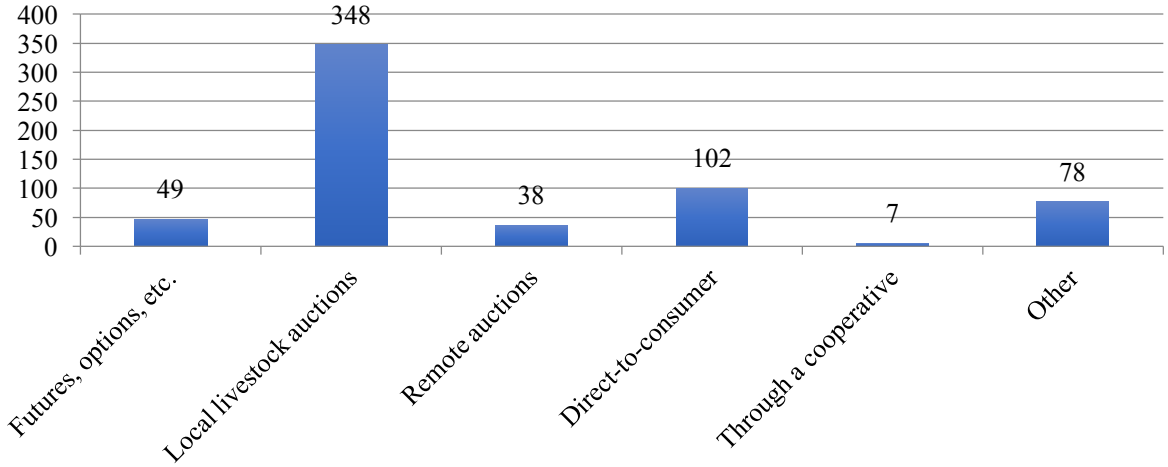

Figure 3.19. Number of ranches that use a particular method of marketing livestock.

Beyond livestock, ranchers supplement their income in a number of ways. Ranchers realize the potential revenue generation that their land holds from other endeavors, including activities such as hunting outfitting, lodging, and ranch tours. Figure 3.20 shows the number of ranches that offer different types of activities, with hunting activities being the most prevalent. Additional revenue can come from selling hunting permits. Of the ranches surveyed, approximately 30% received hunting permits and over half those were sold to the public. Additionally, around 5% of a household's income came from growing and selling crops. Finally, the second largest source of income for surveyed ranches came from off-ranch employment or investments (Figure 3.21). Most likely this pertained to households where one spouse worked outside of the ranch or the ranch was a secondary source of income. Section III.5 below further examines differences between groups that that vary in the net revenue generated from livestock.

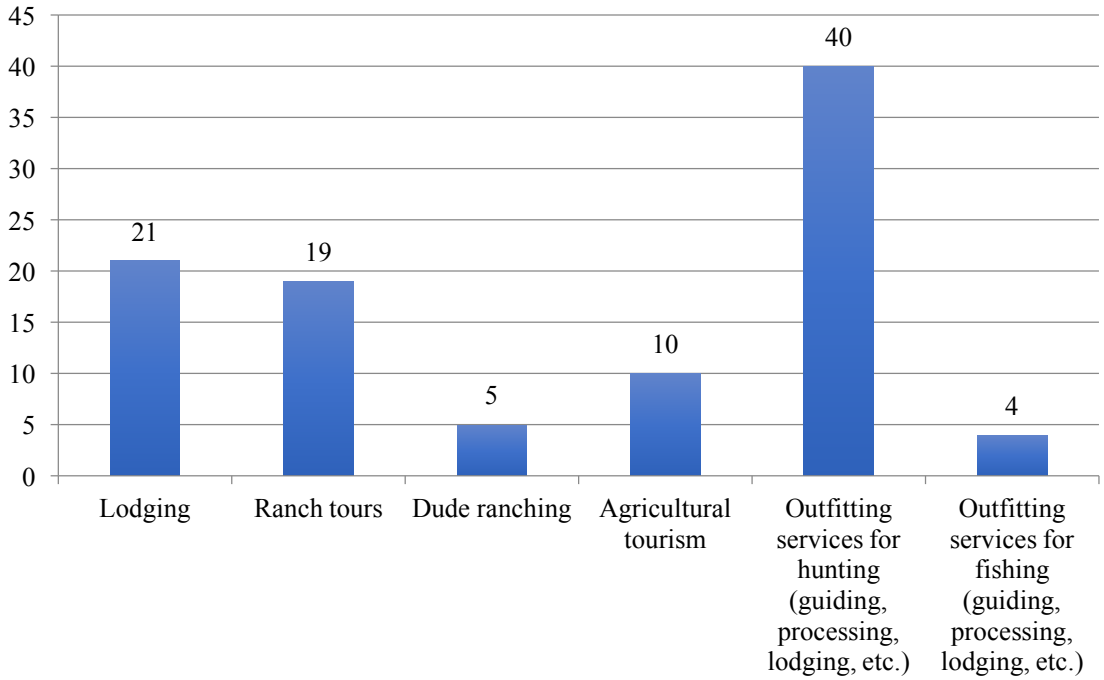

Figure 3.20. Number of ranches that offer alternative activities outside of livestock.

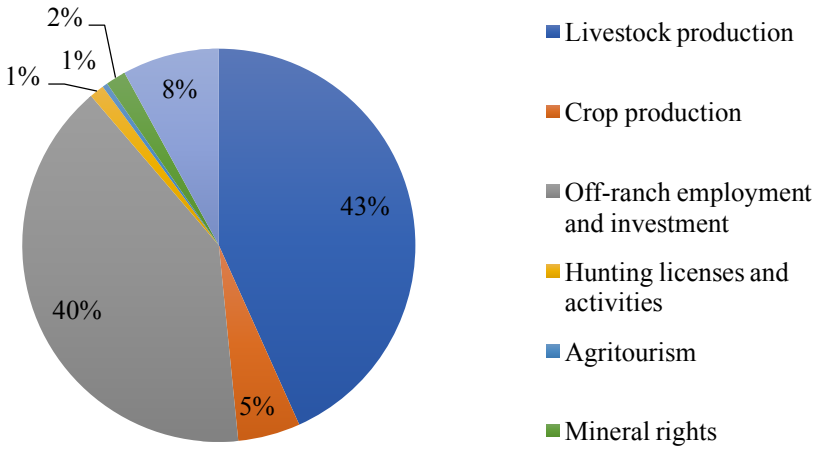

Figure 3.21. Average percent of annual household income of respondents.

III.4 RANCHER PERCEPTIONS ON THE FUTURE OF RANCHING

An important driver of the current actions by ranchers is how they perceive the future of ranching both at a personal and industry level. This section sets out to determine how ranchers view the future of ranching in New Mexico

Background

As previously discussed, there are a couple of recent trends within the ranching community that are causing concern about long term viability. First, there is an aging population of ranchers. And while there is a surge of younger adults taking up the livelihood, it is at a lower rate than those that are leaving. The lack of younger adults creates a difficult situation for current ranch owners that must decide the fate of their ranch. While ranchers may not know exactly what to do with their ranch, there are options which include possibilities like selling the ranch, passing the ranch along to the younger generation, or placing the ranch and land in a conservation easement.

Survey Results

The results from the current survey show the situation may be more positive than initially thought. Almost two-thirds of the respondents indicated that someone from the younger generation is currently involved in ranching. Still encouraging is that around 56% believe that it is somewhat or very likely that someone from this younger group will end up taking over the ranch. However, this percentage still leaves a large number of ranches that are unsure about the future and must decide what they will do with their land and operation. This uncertainty is reflected in a higher percentage indicating they plan on selling their ranch or do not currently having any plans after retiring. Of those that expect the younger generation to take over, 50% plan on transferring their land to a family member or friend (see Table 3.2). There are also a large number of individuals that do not plan on retiring.

Table 3.2. Comparison of future plans of ranchers by the certainty of the younger generation taking over the ranching operation.

Response	Expects the younger generation to take over ranch	Uncertain of the younger generation's plans
Transfer to family or friend	25%	50%
Place in a conservation easement	0.51%	1.2%
Sell it	14%	3.6%
I have not planned anything yet	25%	12%
I don't plan on retiring	36%	41%
Other	8.1%	7.5%

When considering the future of their particular ranch, Table 3.3 shows the average response about the land and operation, development, and wildlife habitat conservation. Overall, those that responded to the survey said it was important to keep the land in the family, followed by an almost equally strong desire to continue as an operating ranch. Promoting or preventing any type of development is of lower concern, but there is more desire to prevent development. Finally, ranchers seem to consider wildlife habitat as an important component of the landscape and one to conserve on their land for the future.

Table 3.3. Importance of possible outcomes concerning an individual's ranch.

Response	Average
Keep land in the family	3.55
Maintain land as an operating ranch	3.53
Promote private or commercial development	1.36
Prevent private or commercial development	2.80
Conserve wildlife habitat	3.15

On a scale of 1-4, where 1=Not important and 4=Very important

In an effort to assess the value that ranchers place on their lifestyle, heritage, and its future, participants were asked about participating in a conservation easement. This process would allow for ranchers to enter into an agreement to get paid for giving up certain future development rights. While conservation easements would be agreed upon by both parties, the land owner would benefit from an initial cash flow that could help solidify the future of their property as a functioning ranch. However, results show that an overwhelming number of land owners (84%) have no interest in entering into a conservation easement with any entity, non-profit land trust, state agency, or federal agency (see Appendix A.2 for further discussion). While most people suggest that they are either indifferent or agree with the concept of easements in general, the main reason most ranchers gave for not wanting to participate is that they do not want anyone telling them how to use their land (Figure 3.22).

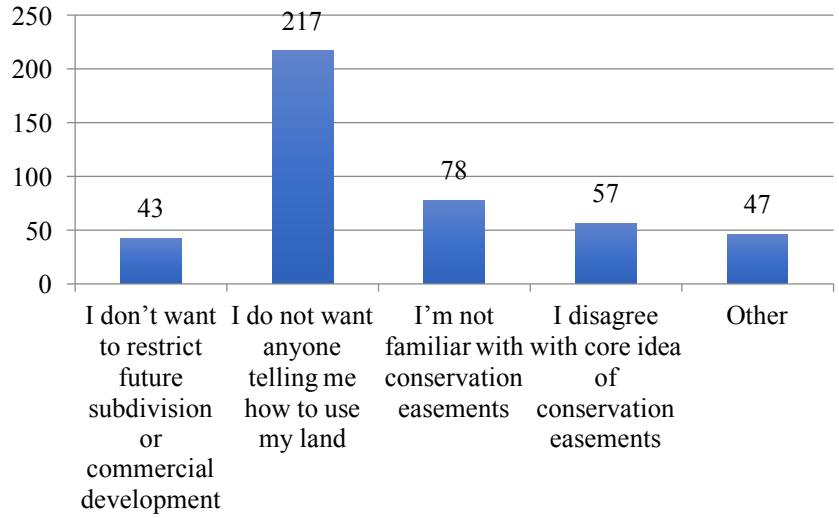

Figure 3.22. Number of responses of why a person was not willing to participate in a conservation easement (multiple answers could be selected by the same respondent).

III.5 COMPARISON OF RANCHES BY NET INCOME

Figure 3.23 shows the breakdown of self-reported net revenue from livestock of the surveyed ranchers. Simple observation shows a high number of operations that make $20,000 or less. This section explores the differences between ranches around the $20,000 per year of net revenue threshold.

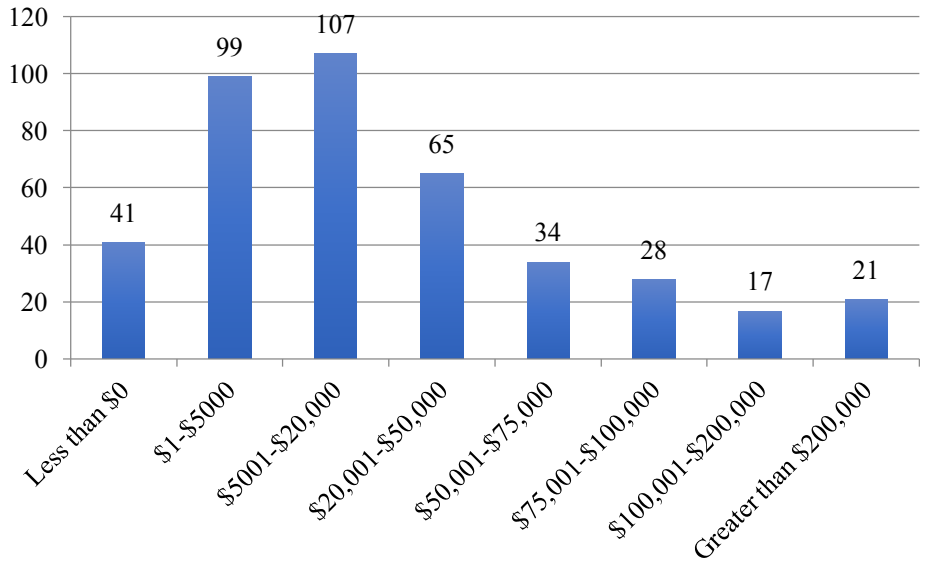

Figure 3.23. Breakdown of self-reported net-revenue from livestock.

While other sources of income exist, the self-reported net revenue from livestock is often the most important for any ranching operation. A large number of ranches report income from livestock at or below $20,000. As a result, we were interested in comparing what we call "lower-income ranches," earning less than $20,000 net revenue from livestock annually, and "higher income ranches," earning more than $20,000 net revenue annually. Tables 3.4-3.6 highlight a number of differences in ranch characteristics, land use, and source of overall income. A t-test was performed to identify areas where the two groups significantly differed from each other.

Considering the characteristics of the two groups of ranches, it appears evident that higher net revenue operations correspond to physically larger overall ranches and greater number of livestock. This observation suggests economies of scale where profit per unit of livestock increases with the size of operation. Arguably there could become a threshold where this is no

longer true as a ranch may need more equipment or labor. However, there appears to be no significant difference in the amount of outside labor employed between the two groups. Increasing acreage appears to be an important component regardless of the land source, i.e. privately owned or leased from a private or public entity.

Another important difference between the two groups is the type of livestock management strategies employed. In general, results suggest that a greater percentage of lower revenue ranches utilize continuous grazing, while higher income ranches are more likely to use simple rotational grazing or even holistic management. On the surface, this observation would appear to be counterintuitive as these strategies tend to be costlier than a basic continuous grazing scheme. However, it is possible that they may be more profitable as the increase in output is greater than the additional inputs required. Further, as will be explored more below, lower revenue ranches tend to get more ranch income from sources outside of livestock. These lower revenue operations may not have the interest, resources, or time to intensify management.

Table 3.4. Comparison of ranch characteristics and land management practices based on net revenue from livestock.

Ranch Characteristics	<=$20,000	>$20,000	Average
Acres ranched***	3.54	4.84	4.15
Acres owned***	2.76	4.13	3.40
Number of livestock***	3.13	4.98	4.00
Acres of private land leased***	2.00	2.75	2.35
Acres of public land leased***	2.00	3.35	2.64
% of land irrigated***	1.58	1.23	1.41
Tenure of family in ranching	4.88	4.73	4.81
Amount of labor supplied by the family	4.51	4.48	4.49
% of ranches that use the following livestock/land management strategy			
Continuous***	43.70	30.09	37.22
Simple rotational**	71.97	81.98	76.79
Intensive rotational	24.68	23.04	23.89
Holistic***	24.90	34.82	29.68
% Leasing out land	11.44	10.14	10.82

t-test significance is indicated as follows: * 10% level, ** 5% level, *** <1% level

While the two groups differ in the revenue generated by livestock, it is possible that land owners are gaining income from other uses of their land. Results, shown in Table 3.5, indicate that there is only a difference in the number of ranches that were allotted and sold hunting licenses. As mentioned previously, higher income ranches tended to be larger and were more likely to have public land. The more land area provides greater potential for hunting activities. Beyond hunting licenses, both groups were very similar in the percentage of ranches that engaged in other activities on their land.

Table 3.5. Land use diversification by net revenue from livestock.

% of ranches that:	<=$20,000	>$20,000	Average
were allotted hunting licenses***	24.03	38.68	31.01
sold hunting licenses*	47.37	59.04	54.28
offered lodging	5.26	3.40	4.35
offered tours	3.64	4.25	3.94
offered dude ranching	1.61	0.42	1.03
engaged in agritourism	1.61	2.55	2.07
provided hunting outfitting	5.67	11.06	8.30
provided fishing outfitting	1.62	0.00	0.83

t-test significance is indicated as follows: * 10% level, ** 5% level, *** <1% level

Finally, when considering the actual source of overall income for each ranch, other differences between the two groups emerge (see Table 3.6). As a generality, higher net revenue from livestock corresponded to larger ranching operations where a significantly greater percentage of total income was from livestock and crops. As most labor is supplied in house, it is understandable that a larger proportion of household income is from livestock revenue. On the other hand, smaller operations that generate less household income from livestock are often engaged in some other off-ranch employment. This trend suggests that for these families ranching may simply supplement the household income and is not its main source. In some cases, net revenue for some ranches is actually negative. While each individual case is unique, a majority of respondents indicated they were in ranching for the lifestyle or continuing family legacy.

Table 3.6. Comparison of sources of household income by income group.

% of income from:	<=$20,000	>$20,000	Average
crops	6.19	4.06	5.13
livestock***	30.22	56.36	43.29
off-ranch employment***	50.72	29.90	40.31
hunting/fishing services	1.20	1.21	1.21
Agritourism	0.47	0.40	0.44
minerals	1.38	1.93	1.66
other sources*	9.80	6.12	7.96

t-test significance is indicated as follows: * 10% level, ** 5% level, *** <1% level

III.6 RANCHING INFORMATION SOURCES

Individuals can obtain information about ranching from a number of different resources. Where and how people receive information may have an impact on their land management strategies and operations. The following section attempts to identify any trends or characteristics of individuals and their ranches and where they receive their information.

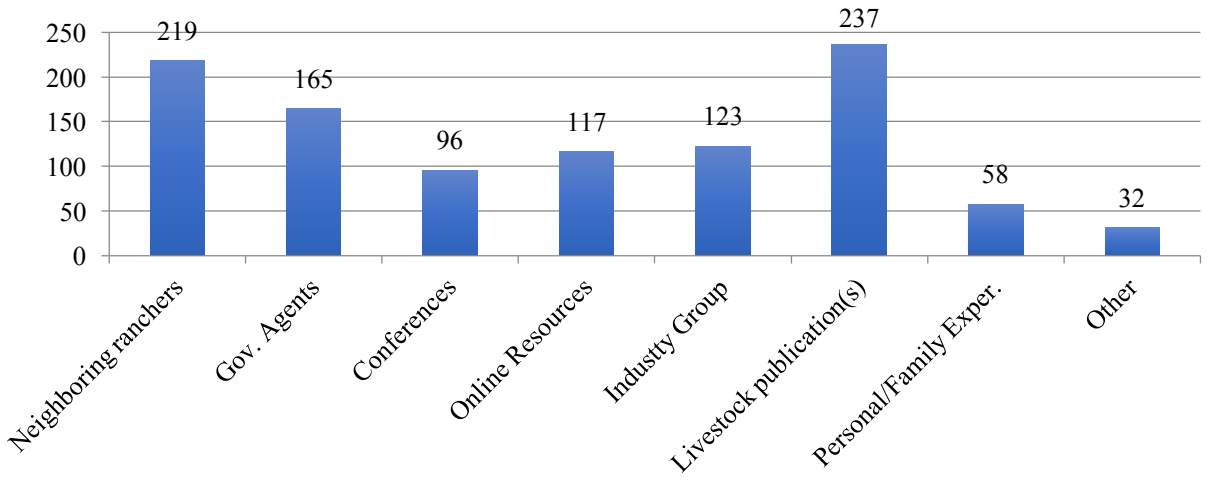

Figure 3.24. Number of responses for each source of information about ranching.

As seen in Figure 3.24, people use a wide variety of sources to obtain information about ranching and land management. There appears to be a strong network within the ranching community where neighbors assist each other or provide experiential knowledge. While all

sources are important, livestock publications, extensions agencies, and agency groups reach the most people, closely followed by online resources and conferences. It should be noted that the low number of responses for personal or family experience is most likely due to the fact it was not a specific option on the survey (we used written responses to parse out this segment). This experiential information would include information or knowledge that is learned through the years personally or was passed down by older generations from what they had practiced.

Table 3.7. Comparison of ranch characteristics and land management practices based on source of ranching information.

	Neighbor	Extension Agency	Confer.	Online	Industry group	Industry Pub.	Other
Simple	77.72	83.85	75.82	78.57	83.33	81.79	68.23
Intense	21.63	25.48	25.27	21.30	22.88	20.35	24.70
Holistic	27.27	38.75	53.19	37.48	39.50	33.77	32.58
Continuous	40.67	27.85	28.57	33.94	29.66	33.19	33.52
Invasive	1.74	1.89	1.95	1.89	1.73	1.78	1.41
Brush	1.59	1.67	1.83	1.63	1.56	1.62	1.33
Acres ranched	4.10	4.36	4.74	4.50	4.62	4.58	4.12
Number of acres owned	3.28	3.49	3.83	3.74	3.56	3.70	3.36
Number of livestock	3.9	4.32	4.71	4.32	4.51	4.50	3.90
Net Revenue	3.49	4.02	4.19	3.90	3.87	3.86	3.57
N	219	165	96	117	123	237	90

Table 3.7 allows for further visual comparisons of ranch and personal characteristics that use a particular information source. It should be noted that the results are strictly observational and not necessarily significant as a respondent could select multiple information sources. In particular, there is one information source that deserves special attention. First, with approximately 20% of the respondents getting at least some of their information from conferences, there seems to be a trend for those individuals to engage in more intensive management practices. In other words, attending conferences increases the frequency of practicing holistic management and controlling for invasive species and brush encroachment. Further, ranchers that attend conferences tend to have a greater number of livestock resulting in greater net revenue. One possible explanation is that these individuals are naturally more

engaged in the industry as a whole. They are also more willing to expend the effort to not only go to conferences but incorporate new ideas and techniques on their lands.

III.7 COMPARISON OF RANCHES BY RANCH LAND OWNERSHIP

With so much of the state land publicly owned (see Figure 3.25), a large proportion of ranchers utilize these lands for livestock grazing. However, as Figure 3.26 shows, around 45% of the respondents do not use or do not have access to public lands. This section examines if there are any differences in the size or operation of ranches that use public resources and those that do not.

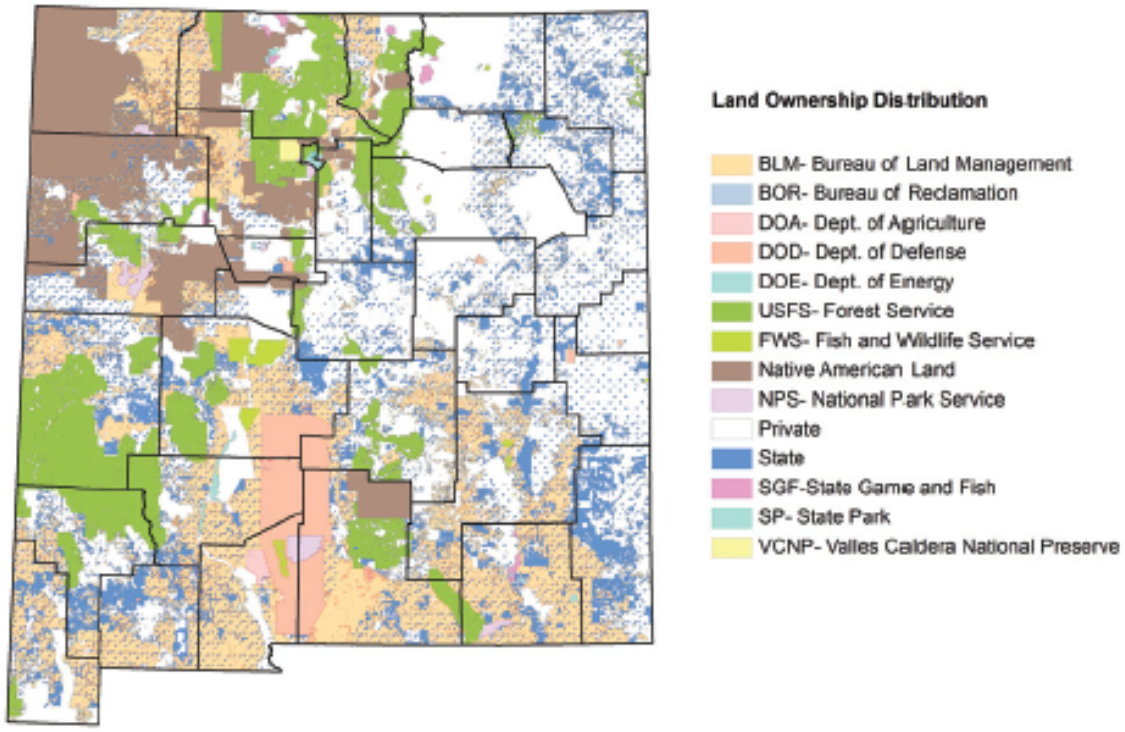

Figure 3.25 Distribution of land ownership in New Mexico. (from Torell 2010)

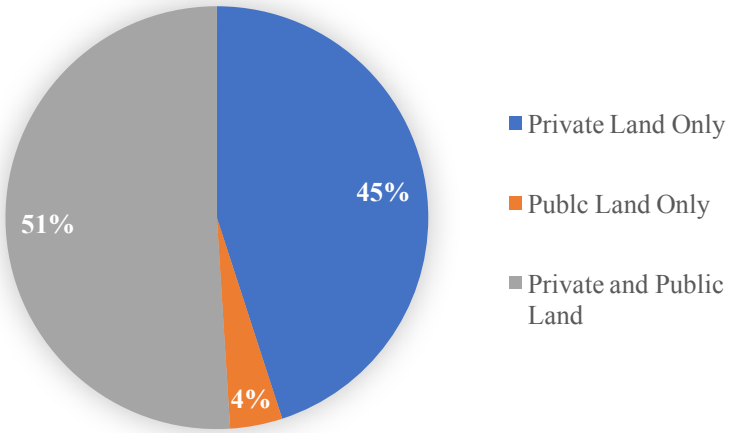

Figure 3.26. Percent of ranches by type of land ownership.

As would be expected, those with access to public lands tend to ranch significantly larger areas than those that graze on private land only (see Table 3.8). Public allotments tended to supplement privately held acreage making these operations larger. Interestingly, those with public access tended to own more land as well suggesting larger operations in general. The larger operation translates into greater number of livestock and higher net revenue from these livestock, further suggesting a higher profitability in ranching either through reduced operational costs or economies of scale. While it is not clear if having both private and public land on which to graze improves ranch viability, anecdotally, many ranchers indicated that they would not be able to survive without access to government controlled lands.

Table 3.8. Comparison of ranch characteristics and land management practices of private ownership versus public/private ownership ranches.

	Private only	Private and/or public
Acres ranched***	3.29	4.84
Acres owned***	2.84	3.85
Number of livestock***	3.00	4.80
% of land irrigated***	1.14	1.75
Tenure of family in ranching	4.76	4.87
Amount of labor supplied by family	4.53	4.48
% of ranches that use the following livestock/land management strategy		
Continuous	39.5	35.43
Simple rotational**	72.63	80.16
Intense rotational	24.36	22.27
Holistic***	21.39	36.58
Invasive species management**	1.96	2.12
Brush encroachment management**	2.07	2.30
Net revenue from livestock***	2.84	4.12
Average number of livestock certifications	0.77	0.85
Average number of sources from which they obtain information***	1.99	2.47
% of ranches allotted hunting licenses***	0.17	0.43
Hunting Outfitting offered***	3.86	12.23

t-test significance is indicated as follows: * 10% level, ** 5% level, *** <1% level

Not only does the size of the operation differ between private only and public/private ranchers, but so does how these individuals manage their livestock and land. While no generalities about causality can be made, there are a number of significant differences between the two groups. Table 3.8 shows that ranches with both public and private lands are more likely to use a simple rotational grazing scheme or engage in holistic practices. As Figure 3.27 shows, 46% of the 51% that have both private and public land manage the two in the same way. Managing the land in similar ways suggests that ranchers are carrying over management practices from their private lands or vice versa. While it is unclear which way the management style flows, federal lands often have required grazing practices such as maximum stocking rates and livestock rotation schedules. This could potentially spillover into private land practices. Further evidence of differing land stewardship can be seen in the higher frequency of invasive

species and brush management for those with both types of land versus those that only have private. Underlying any differences is the fact that those that utilize public lands obtain their information on ranching from a greater variety of sources.

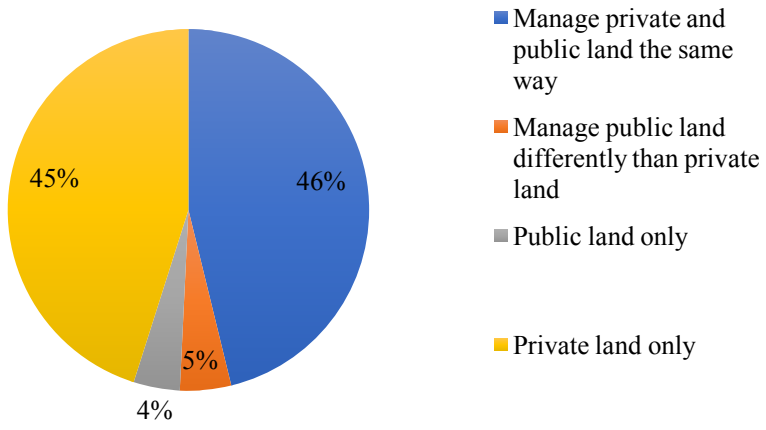

Figure 3.27. Comparison of management differences on private and public lands

Finally, a few other notable differences exist. New Mexico Game & Fish incorporates the amount of public land in an area when allotting hunting permits to ranches (more specifically called authorization certificates). It is understandable that those with greater access to public lands receive more permits. In turn, a greater number of these ranches offer hunting outfitting services as an additional revenue source (Table 3.8). Besides hunting, however, there is no statistical difference in the number of other activities that could be offered on the ranch between the two groups.

III.8 RANCHER PERCEPTIONS AND RESPONSE TO DROUGHT

The change in climatic conditions, such as more prevalent drought, can have profound impacts on rangeland productivity. Reduced forage quality and availability impacts livestock production and ranching livelihoods. This section examines ranchers' perceptions about the history of drought in New Mexico and their response to any changes.

Figure 3.28 shows that over 84% of surveyed ranchers believe that rangeland productivity has changed over the years due to drought. This suggests that ranchers have had to adapt their management in response to the changing landscape. The results indicate that approximately 81% of ranchers have, indeed, changed their land management practices in response to drought. Reduced stocking rates, different grazing strategies, and more effort placed in combating invasive species and brush encroachment are all options ranchers may employ in dealing with drought.

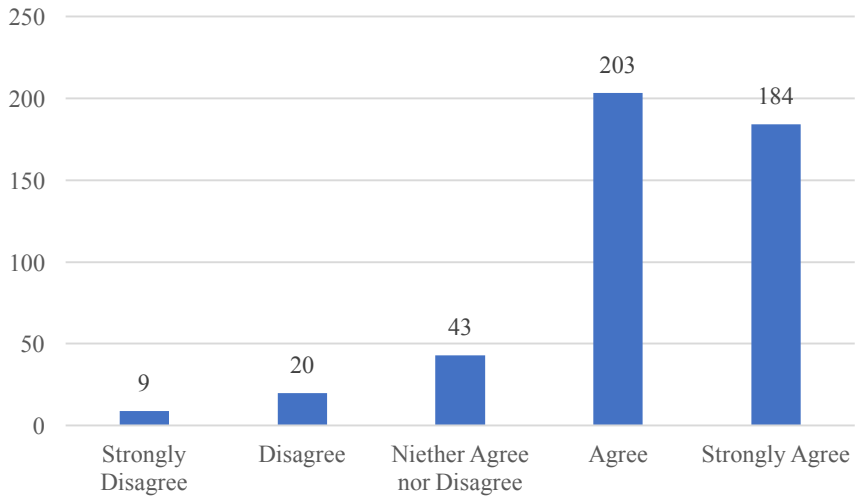

Figure 3.28 Number of responses pertaining to if ranchers' beliefs on changes in forage quality and productivity due to drought.

Table 3.9 compares the reported grazing strategies and land management practices between those that have adapted to drought conditions and those that have not. In all but intense rotational grazing, there is a significant difference between the two groups. For those that have changed their strategies, they are much more likely to use a simple rotational or holistic grazing system. In addition, they control for invasive species and brush encroachment much more frequently. Alternatively, those that either do not believe drought has change rangeland conditions or have not done anything in response to drought are much more likely to use a continuous grazing scheme. While it cannot be determined if people have switched from one style of management to another, there is evidence that those ranchers who have experienced more drought conditions use a higher input management strategy.

Table 3.9. Comparison of land management practices between those that have changed practices due to drought and those that have not.

	Have changed management practices	Have not changed management practices
Continuous***	33.90%	55.00%
Simple***	80.78%	61.73%
Intense	23.58%	21.52%
Holistic***	32.69%	13.58%
Invasive species***	2.11	1.78
Brush encroachment*	2.24	2.06

t-test significance is indicated as follows: * 10% level, ** 5% level, *** <1% level

Finally, while there are a large number of people who believe drought is changing the landscape, only a little more than half (~58%) want policy created to help alleviate the impacts of drought (Figure 3.29). In fact, many ranchers are undecided on possible drought policy. Two issues may explain the low agreement and indifference. First, we received many comments about not wanting to be told how to use the land. Additionally, ranchers had a hard time envisioning how policy would be help with drought.

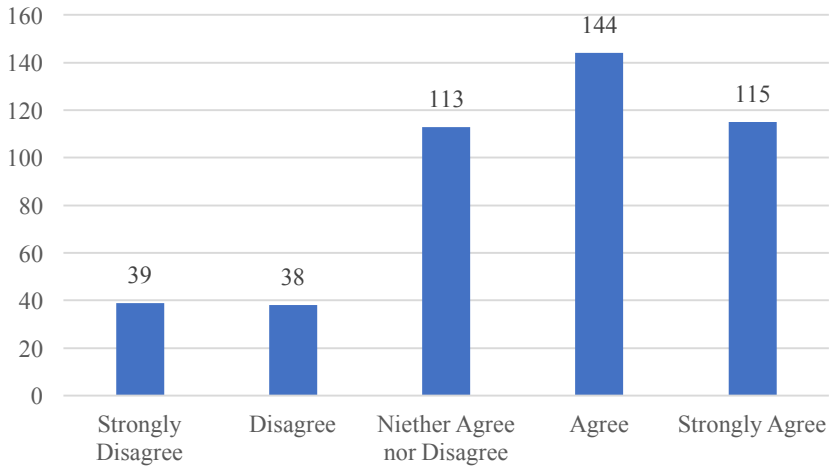

Figure 3.29. Feelings towards developing and implementing policy to help alleviate drought impacts.

III.9 FUTURE PLANS OF NON-RETIRING RANCHERS

When asked about their future plans, a large number of respondents indicated that they had no plans to retire from ranching. The following section explores any differences between those that are not retiring versus those that have other plans when it comes to the future of their ranch.

Table 3.10. Comparison of land management practices between ranchers that have changed practices due to drought and those that have not.

	Not Retiring	Other Plans
Younger generation ranching	.656	.601
Younger generation takeover*	3.60	3.35
How long to continue to ranch***	4.52	3.70
Keep in family**	3.65	3.49
Keep as a ranch***	3.65	3.45
promote development	1.41	1.32
prevent development	2.89	2.73
conserve wildlife habitat	3.22	3.10
Easement participation	0.16	0.17
Tenure of family in ranching**	4.98	4.69
Acres ranched**	4.36	4.01
Number of livestock**	4.24	3.86

t-test significance is indicated as follows: * 10% level, ** 5% level, *** <1% level

Table 3.10 highlights some unique characteristics about ranchers and their ranches who do not plan on retiring from the industry. As indicated by the number of acres ranched and the number of livestock, the "not retiring" group has larger operations in general. While there is no difference in the younger generation that is directly involved, those that do not plan on retiring believe at some point the younger generation will take over. Further, they hope to see the ranch not just stay in the family, but also to keep the land as an operating ranch. Such preferences may provide the "not retiring" individuals with the incentive to stay in ranching indefinitely to make sure the land transitions to the next generation. Additionally, the family legacy of ranching in New Mexico is significantly longer for those "not retiring," suggesting they want to continue the ranching tradition.

PART IV: CONCLUSIONS AND POLICY RECOMMENDATIONS

Our survey results confirm that ranchers and ranches are diverse in New Mexico. And although the results vary significantly from ranch to ranch, it is important to note that land management practices appear to be related to levels of income from livestock, the size of the ranch, access or use of public lands, and the location from where people get their information. Additionally, there is a consistent feeling of uneasiness about the future of ranching and individual's ranches in particular. Even with this uncertainty, people are very reluctant to enter into agreements with other entities, such as through conservation easements, to help preserve their lands and heritage. Respondent comments suggest that this hesitancy stems from previous dealings and not wanting to be told how to manage their land (see Appendix A.4 for a sample of comments). Overall, due to this diversity and uncertainty, a single approach or policy towards ranching may, at best, not reach the entire community, and at worst, harm ranchers across the state. Therefore, actions and policy should be direct and targeted with a specific goal in mind. Some focus areas and policy recommendations are:

- Simplify the certification process for livestock, such as organic, free range, and grassfed.
- Promote marketing of New Mexico products to direct and outside markets.
- Clarify, simplify, and equalize access to public lands. Promote sustainable land management practices on these lands that may spill over onto private lands.
- Enhance knowledge about the benefits and costs of higher input management such as holistic practices.
- Increase awareness of opportunities for ranchers to preserve their ranch and heritage through tools such as conservation easements and reduced tax burdens.
- Promote alternative activities on rangelands such as tourism, hunting activities and even renewable resources.

There is great opportunity for these recommendations to be implemented by private and government entities. Reducing the volatility and uncertainty within the ranching community can help preserve the industry and promote economic prosperity for New Mexico.

REFERENCES

BLM. 2011. *Innovative Partnership Formed to Restore West Potrillos*. http://www.blm.gov/nm/st/en/prog/restore_new_mexico/innovative_partnership.print.html.

Cheatum, Molly, Frank Casey, Pelayo Alvarez, and Ben Parkhurst. 2011. "Payments for Ecosystem Services: A California Rancher Perspective." *Conservation Economics White Paper. Conservation Economics and Finance Program. Washington, DC, USA: Defenders of Wildlife*. http://www.live.defenders.org/publications/payments_for_ecosystem_services_a_california_rancher_perspective.pdf.

Diemer, Joel, Terry Crawford, and Michael Patrick. 2014. "Agriculture's Contribution to New Mexico's Economy." Las Cruces: New Mexico State University Cooperative Extension Service. http://aces.nmsu.edu/pubs/_circulars/CR675.pdf.

Dillman, Don A., Jolene D. Smyth, and Leah Melani Christian. 2014. *Internet, Phone, Mail, and Mixed-Mode Surveys: The Tailored Design Method*. 4th edition. Hoboken: Wiley.

Gay, Joel. 2015. *NM Resident Hunters Need Elk License Overhaul*. http://thenewmexicosportsman.com/wp-content/uploads/2015/07/Spring-2015-online.pdf.

Global Center for Cultural Entrepreneurship. 2015. "Agritourism in Northern New Mexico: A Survey of Activities, Needs, Opportunities." presented at the Agriculture Collaborative Meeting. Accessed August 21. http://www.mrcognm.gov/images/stories/agriculture/12122012_Ag_Survey_Summary_by_GCCE.pdf

Holistic Management International. 2015. "Holistic Management®." *Holistic Management International*. http://holisticmanagement.org/holistic-management/.

Keates, Nancy. 2014. *Billionaire Businessmen Buying Up Mega-Ranches - WSJ*. http://www.wsj.com/articles/billionaire-businessmen-buying-up-mega-ranches-1414076608.

Lubell, M.N., Cutts, B.B., Roche, L.M., Hamilton, M., Derner, J.D., Kachergis, E. and Tate, K.W. 2013. "Conservation program participation and adaptive rangeland decision-making." *Rangeland Ecology & Management*, *66*(6), pp.609-620.

Merlan, Thomas. 2010. "Historic Homesteads and Ranches in New Mexico: A Historic Context." Historic Preservation Division, Office of Cultural Affairs, State of New Mexico. http://www.blm.gov/style/medialib/blm/nm/programs/more/cultural_resources/homestead_docs.Par.81105.File.dat/HISTORICHOMESTEADSANDRANCHES_NEWMEXICO_combined.pdf.

New Mexico Department of Agriculture. 2015. "Number of Farms, Young Farmers, Minority Farmers Rising in New Mexico." Accessed September 4. http://www.nmda.nmsu.edu/uncategorized/number-farms-young-farmers-minority-farmers-rising-new-mexico/.

New Mexico Department of Game and Fish. 2015a. "2015-2016 Season E-PLUS Landowner List." *New Mexico Game & Fish*. Accessed September 5. http://www.wildlife.state.nm.us/download/hunting/maps/e-plus/E_PLUS-Landowner-List-2015_2016.pdf.

———. 2015b. "2015-2016 Season Participating Ranches List for the Antelope Private Lands Use System (A-PLUS)." *New Mexico Game & Fish*. Accessed September 5. http://www.wildlife.state.nm.us/hunting/maps/private-a-plus-e-plus-lands/.

Roche, L.M., B.B. Cutts, J.D. Derner, M.N. Lubell, and K.W. Tate. 2015. "On-Ranch Grazing Strategies: Context for the Rotational Grazing Dilemma." *Rangeland Ecology & Management* 68 (3): 248–56. doi:10.1016/j.rama.2015.03.011.

Southwick Associates. 2014. "The Economic Contributions of Fishing , Hunting , and Trapping in New Mexico in." Fernandina Beach, Florida.

Teague, Richard, Fred Provenza, Urs Kreuter, Tim Steffens, and Matt Barnes. 2013. "Multi-Paddock Grazing on Rangelands: Why the Perceptual Dichotomy between Research Results and Rancher Experience?" *Journal of Environmental Management* 128 (October): 699–717. doi:10.1016/j.jenvman.2013.05.064.

Thacher, J., J. Chermak, K. Grimsrud, and K. Krause. 2010. "The Decision to Mange Invasive Weeds: Which Factors Matter?" http://economics.thacher.us/Home/research2/workingpapers.

Torell, L Allen. 2010. "The Market Value of Ranches and Grazing Permits in New Mexico , 1996 to 2010."

United States Department of Agriculture. 2012. "2012 Census of Agriculture State Profile: New Mexico." http://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/New_Mexico/cp99035.pdf.

Wilson, Joshua, Dawn Denise Thilmany, and Martha Jane Sullins. 2006. *Agritourism: A Potential Economic Driver in the Rural West*. Colorado State University, Department of Agricultural and Resources Economics. http://www.agmrc.org/media/cms/edr0601_CDA89B9A1E15E.pdf.

APPENDIX

A.1 Description of the four contacts and timeline used in the study following the Dillman method.

Contact 1---September 6th, 2016

Initially, a letter notified each household that they had been selected to receive a survey about rangeland management which they would receive approximately one week later. They were informed as to the intent and administering body of the study.

Contact 2—September 16th, 2016

Ten days following Contact 1, a survey packet was sent to all 2,100 households. This included a cover letter detailing why the survey was being conducted, its significance, and why their response was so important for the study. In addition, there were explicit instructions on how to take the survey online with the web address and a unique identifier (access code) for each household. An identical paper survey, both in form and questions, with a stamped return envelope was also included for those that preferred that method. The paper version also contained the same unique identifier to allow for accurate data entry. A consent form was enclosed providing information about the study and an IRB contact. Finally, as an incentive to return the survey a small financial appreciation ($1) was included (Dillman et al. 2014).

Contact 3—September 28th, 2016

A postcard was mailed in the following week serving two different purposes. First, it served as a thank you for those who had submitted the survey via mail or online. It was also a first reminder for those that had not yet taken it.

Contact 4—October 18th, 2016

Approximately three weeks following Contact 3, another packet, which included an additional copy of the survey, was sent to all selected households that had not completed the survey. An accompanying letter politely reminded them about the survey and encouraged them to take the time to fill it out on paper or online.

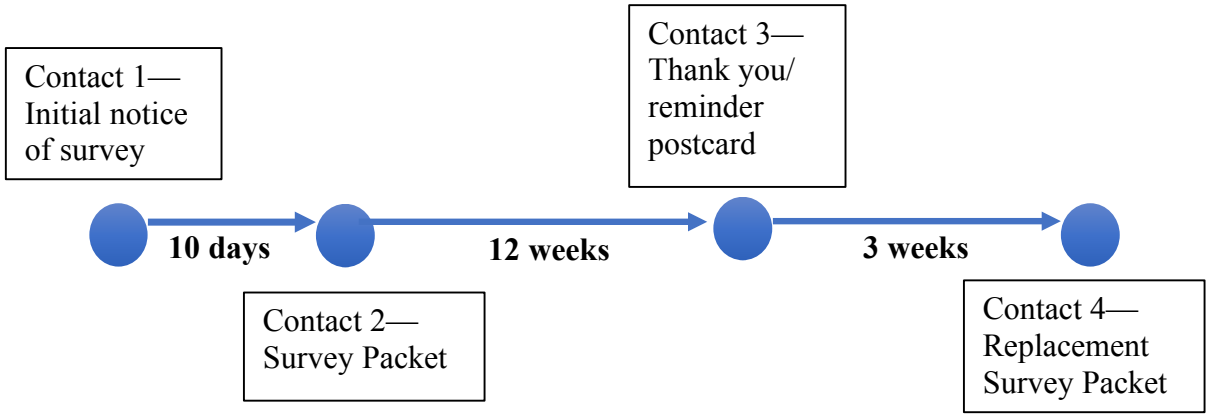

Figure A.1. Timeline of contacts sent to the sample group.

A.2 Basic results from the valuation component of the survey.

Following an extensive description of a scenario about conservation easements, the survey asked:

36. Depending on the payment amount, would you be willing to consider participating in such an easement with (easement holder) to preserve your ranchland for future generations?

Yes or No

The easement holder was either a non-profit land trust, the State of New Mexico, or a federal agency such as the BLM or USFS.

This was followed by:

37. If yes, what would you be willing to accept as a minimum one-time per acre payment to participate in this easement with (easement holder) and preserve your ranchland for future generations?

$ _____ (Fill in the blank)

Results

There was a total of 60 respondents that were willing to participate in the easement. However, only 36 gave an actual value to question 37. Table A.1 provides the basic statistics from the actual values given.

Table A.1. Summary statistics from valuation question on easement participation.

	Value ($)
Average	1946.75
Minimum	1
Maximum	35000
Mode	100

A.3 Additional figures and results from the survey

Below are additional results that were compiled from the survey but were not mentioned in the above report.

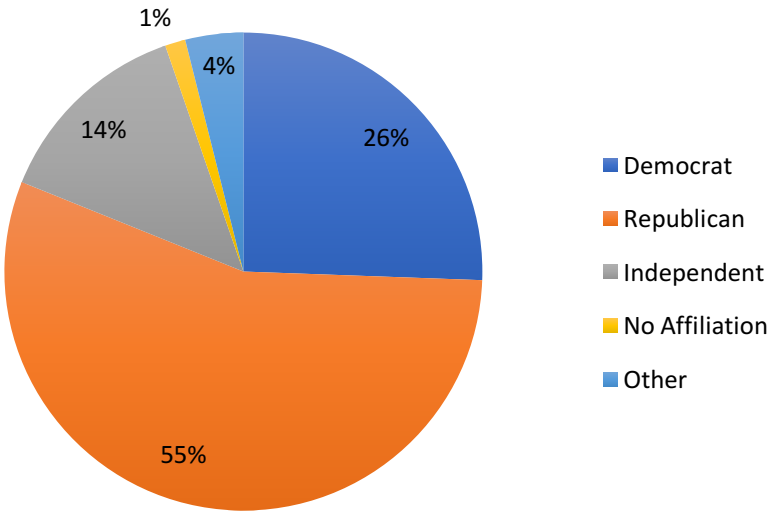

Figure A.2. Political affiliation breakdown of survey respondents.

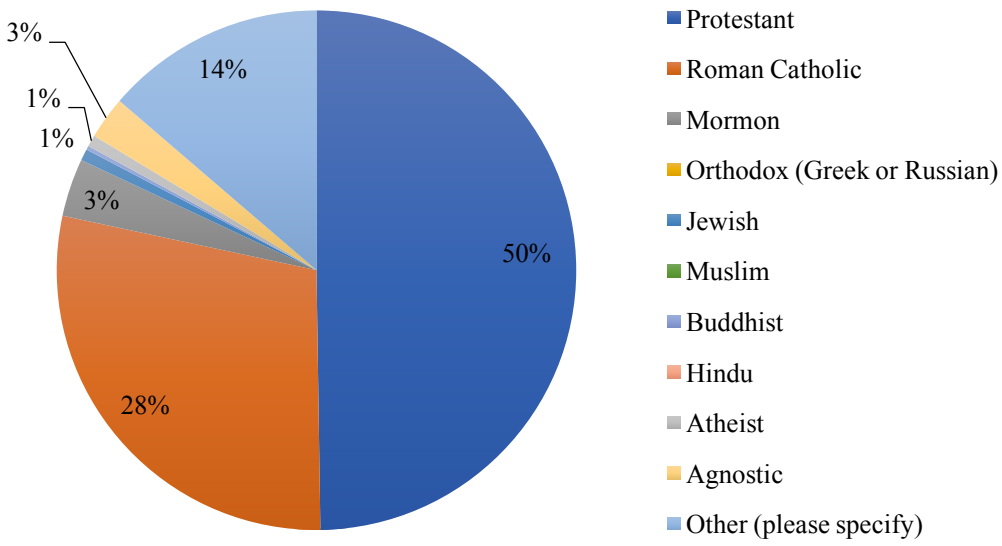

Figure A.3. Religion breakdown of survey respondents.

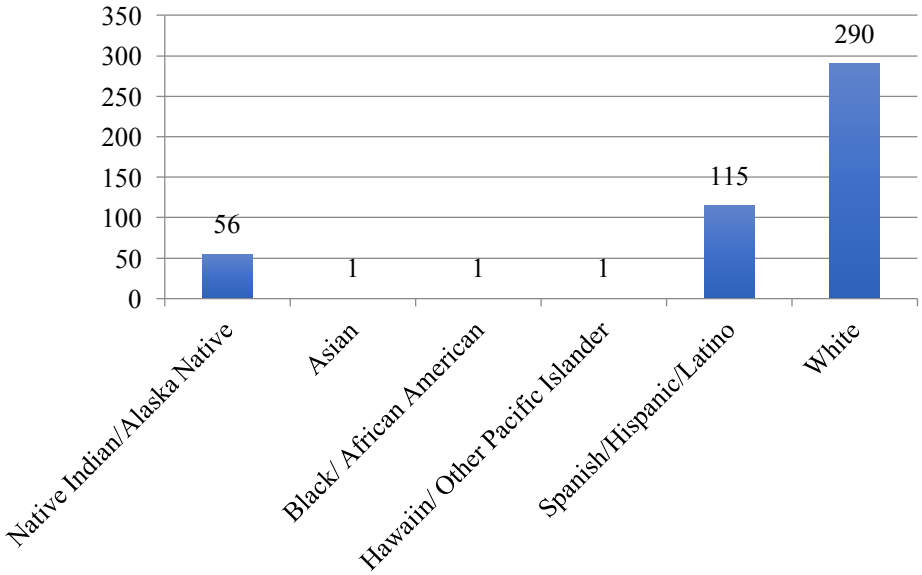

Figure A.4. Self-reported race breakdown of survey respondents.

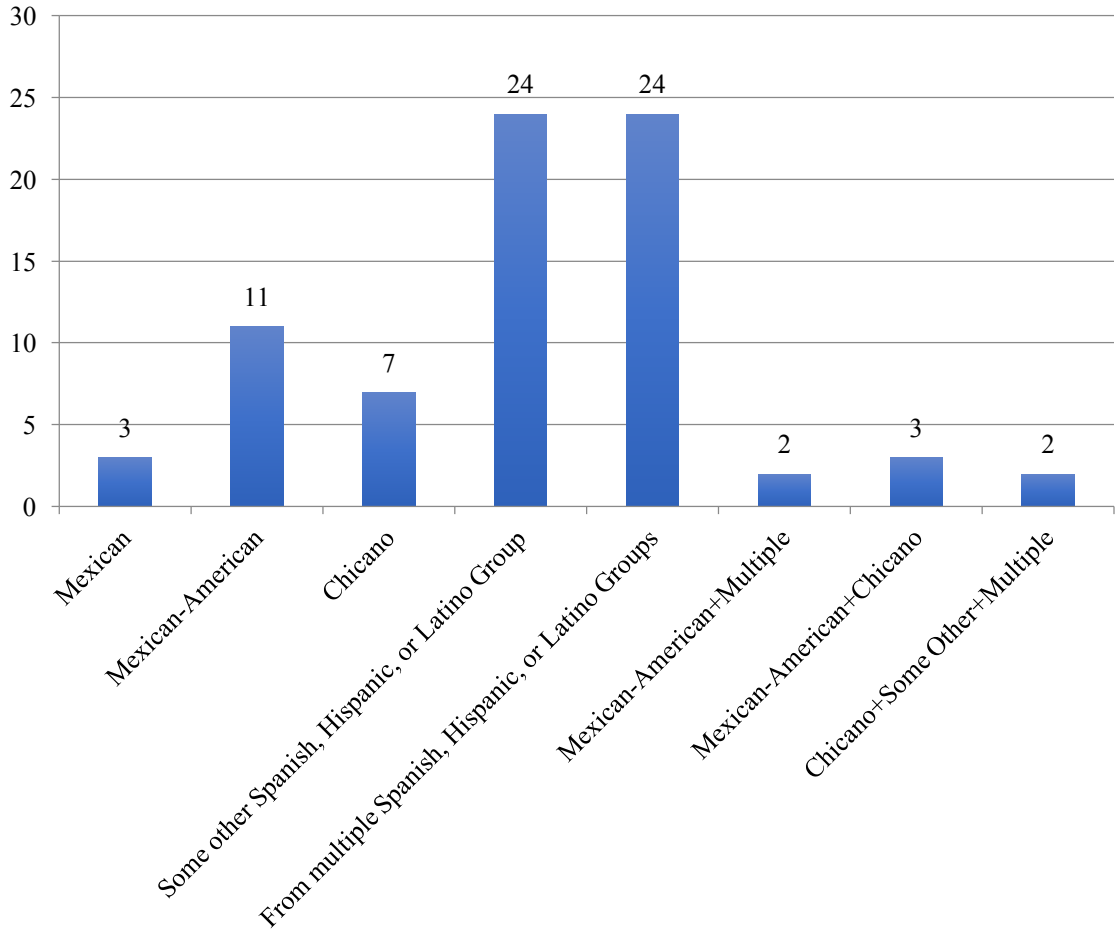

Figure A.5. Breakdown of Spanish, Hispanic, or Latino survey respondents.

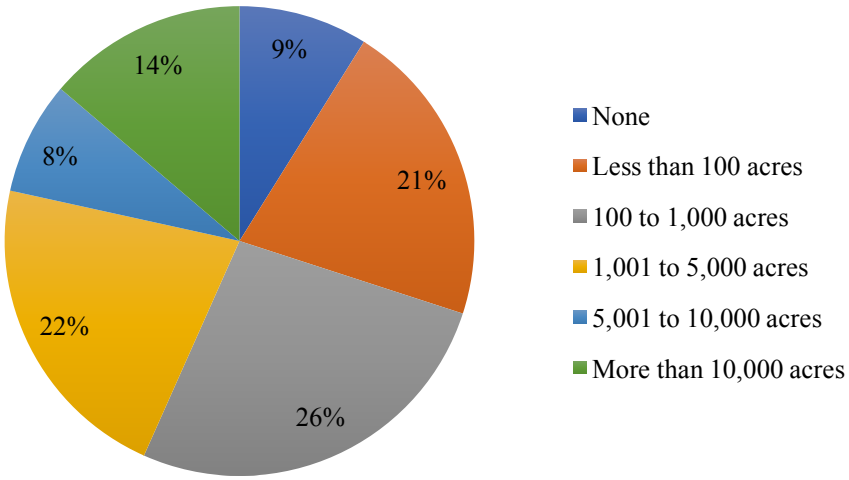

Figure A.6. Breakdown of ranches by number of acres owned.

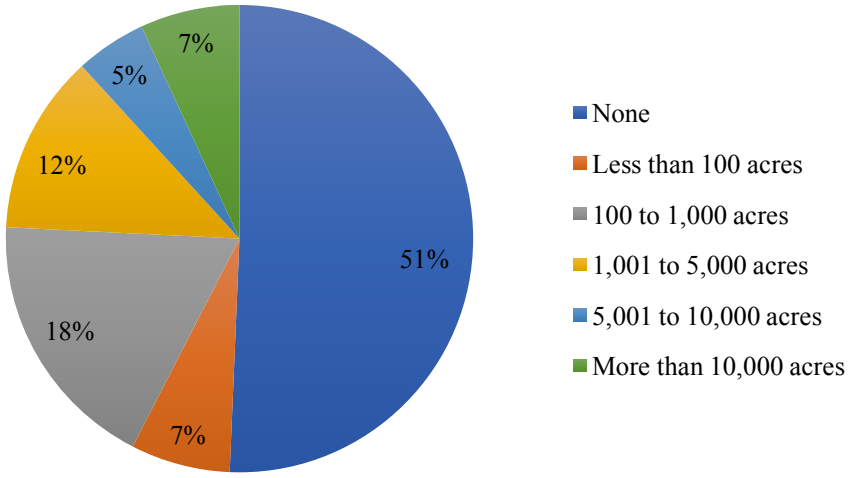

Figure A.7. Breakdown of ranches by the number of acres of private land that is leased/rented.

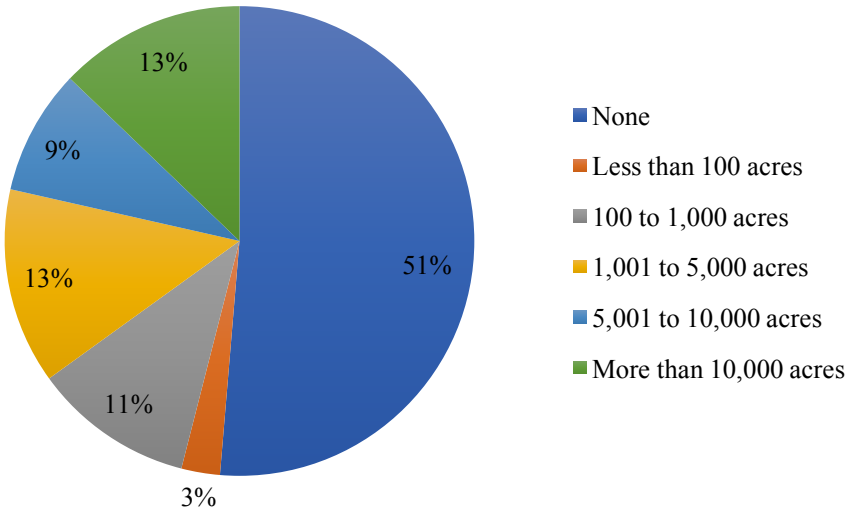

Figure A.8. Breakdown of ranches by the number of acres of public land that is leased/rented.

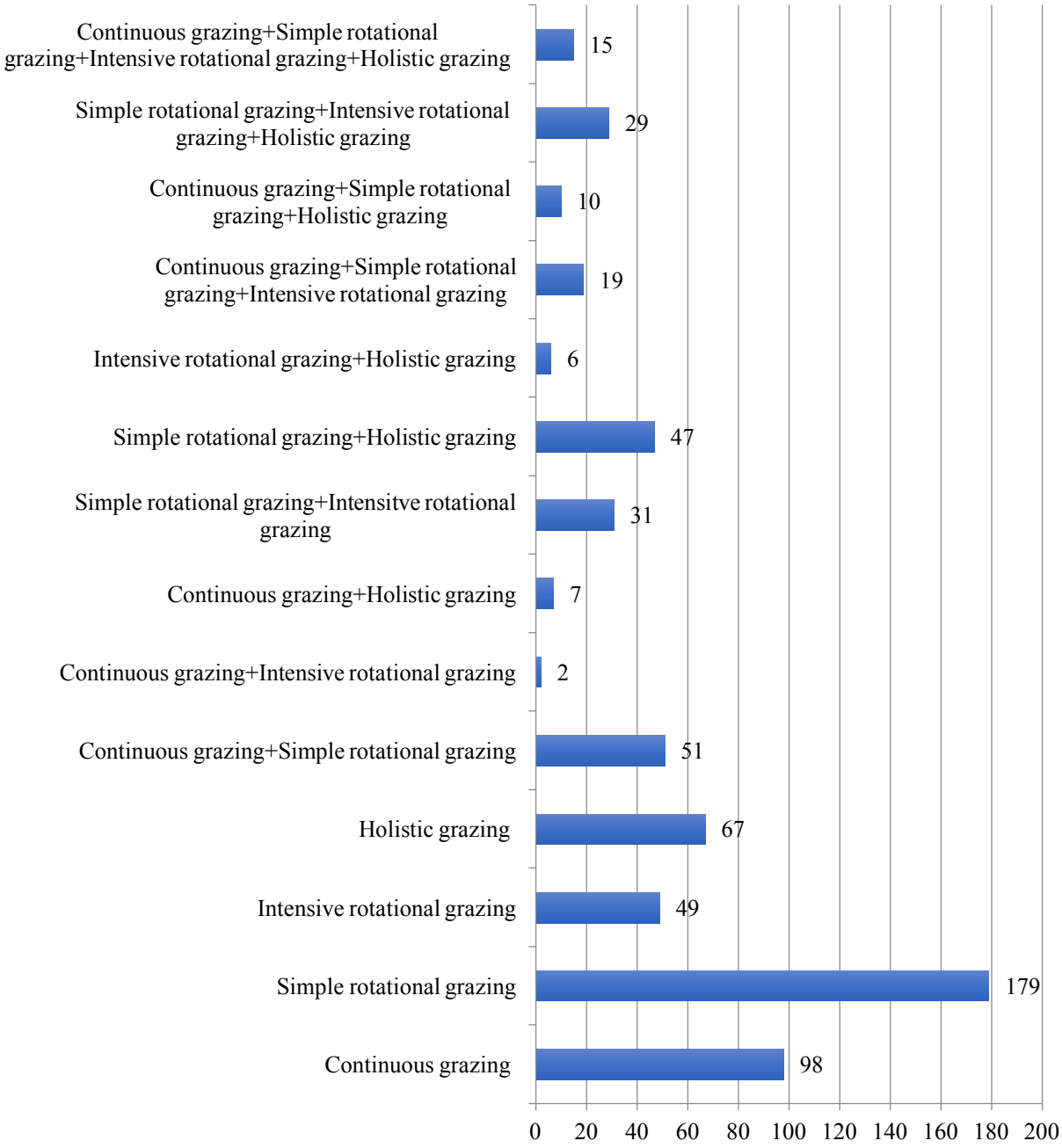

Figure A.9. Number of ranches using particular grazing management systems.

A.4 Sample of comments about why people do not want to participate in conservation easements.

- Government distrust
- Too much government control now
- I want nothing to do with the government
- It seems to me that the stat is thinking about wanting to keep private land at some time in the future and a conservation easement in my opinion-that private land won't be 100% private if a person agrees to one!
- I do not trust government at all
- government interference
- The conservation can be taken care of by the private entity and we have too much government involvement anyway.
- These tend to mismanage land and resources more than ranchers.
- They just sell land to highest bidder
- Need more information to make any type of answer
- The Govt took my land to test the A bomb--no pay or thank you.
- would need all info
- I don't trust the integrity of the state or federal government as it relates to dealing with the ranchers
- would prefer fed easement
- Tired of government overreach
- Tough to manage with not skin in the game!
- Government does need to be in the land business. Government should never be in competition with its people.
- I do not want to restrict my heirs on the use of the ranch when I am gone.
- There are no avenues to sell easements.
- I do not want to restrict decision making of future generations
- Government does not manage land well
- Lack of trust
- I take better use of my land
- Government has no business telling people how to run their ranch from an office in Washington!
- Changes that happen do not want to hinder my family
- It is totally unequal partnership with an entity as powerful as the federal government

While our results show a lack of interest in participating in conservation easements, Cheatum et al. (2011) found that factors such as contract length, payment amount, and the agency administrating the contract were important to rancher participating in conservation programs. Our report and Cheatum et al.'s (2011) report illustrates that conservation participation could be variable in space and should be tailored to each situation.