

DISSERTATION

AMENITY, COMMUNITY, AND RANCHING:
RANCHERS' BELIEFS, BEHAVIORS, AND ATTITUDES
REGARDING RANCHING IN THE WEST

Submitted by

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In partial fulfillment of the requirements

For the Degree of Doctor of Philosophy

Colorado State University

Fort Collins, Colorado

Summer, 2006

UMI Number: 3233343

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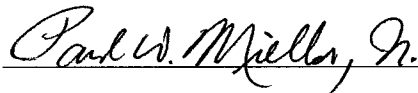
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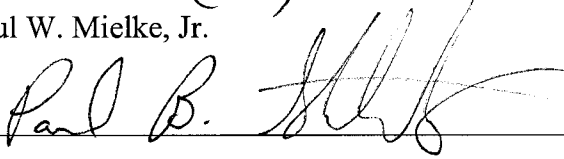
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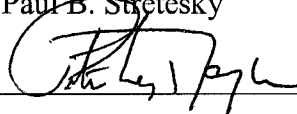
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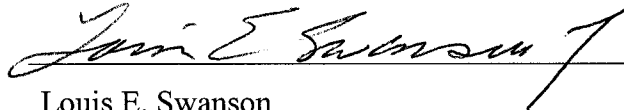
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ABSTRACT OF DISSERTATION

AMENITY, COMMUNITY, AND RANCHING: RANCHERS' BELIEFS, BEHAVIORS, AND ATTITUDES REGARDING RANCHING IN THE WEST

Rural sociology has a rich history of studying issues pertinent to farming, but ranching is typically not studied. When ranching is included, it has historically been subsumed under discussions of the farm as though the two were interchangeable. Real differences, however, exist between ranching and farming, most notably, issues of natural amenity growth (e.g., population increases in areas high in natural amenities such as warm winters, sun, mountain peaks, lush valleys, lakes, and rivers) and the large percentage of public lands in the West.

This research explores differences in ranchers' beliefs, behaviors, and attitudes regarding environmental issues and feelings about community. The study area encompasses two, contiguous Colorado counties: Moffat and Routt counties. Ranchers were surveyed regarding attitudes, beliefs, and behaviors for a variety of questions pertaining to ranching. This phase of the research explores beliefs, behaviors, and attitudes of ranchers regarding environmental and community questions.

Theoretically, amenity development is utilized as a bridge to combine aspects from environmental sociology and the sociology of natural resources through the use of the theory of reasoned action and behavior, and through the literature of community studies. Survey responses are compared to determine differences in how individuals in Routt County, an amenity growth county, experienced ranching as compared to those in Moffat County, a non-amenity growth county. In addition, the analyses

compare responses to see if differences existed between those relatively new to ranching versus those who had been in ranching for a longer period.

Survey responses were coded and analyzed through permutation methods, first articulated by R. A. Fisher. Permutation tests are on the cutting edge of statistical analyses, but are relatively unknown among sociologists. The methodological approach utilized for this dissertation is unique in that it fully relies on permutations for the analysis of the data and further introduces a permutation method for analyzing the differences in consensus between two independent samples.

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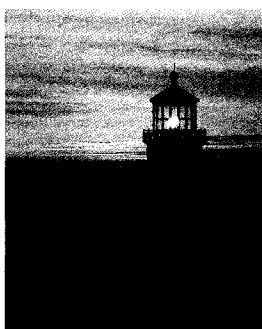
ACKNOWLEDGMENTS

I owe a great deal of debt to a wide array of people who have helped me on this journey: my family, and my friends and colleagues both here at Colorado State University and at the University of Wyoming. I could not have completed this journey without help from all of you.

I would like to thank the members of my committee for reading drafts, helping me think through questions and theories, and for providing emotional support. In particular, Dr. Peter L. Taylor provided helpful insight on the theory, Dr. Paul B. Stretesky strengthened the methods section, and Dr. Louis E. Swanson provided important background and brought up key questions to consider while I was formulating the major concepts to consider in the dissertation. Dr. Swanson's experience and work in this area provided important insights into ways to make this research project unique.

Dr. E. Tom Bartlett was instrumental in this project and provided valuable support and insightful comments on the final draft of the paper. Dr. Bartlett was more than an outside member, he was an integral part of the research and allowed me to better articulate the findings. Special thanks are also due Dr. Paul W. Mielke for agreeing to read this dissertation and serve on the committee when last-minute travel issues prevented one of my committee members from attending the defense in person.

Finally, I would like to thank Dr. Kenneth Berry for his help, support, and patient work on papers that became an important part of the methods for this dissertation. I honestly don't know if I could have done this without his help, expertise, and patience.



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CHAPTER ONE

INTRODUCTION

Because of growth around us, there is no way to expand our operation. The land which surrounds us is owned by a rich individual whose wife and children are vegan. They only tolerate cattle because of the property tax needs. When they are here the cattle must be moved where they can't see them. Their ranch manager has no background in agriculture nor this region. Ranch managers of three of our county's ranches have degrees in public relations, restaurant management, and non-profit management. Respondent number 659, Routt County

The United States was founded on pastoral principles. The founding fathers were farmers and much of the settlement of the U. S. was driven by people seeking land they could farm and call home. Farmers have long been considered the epitome of what it means to be an American. An important note is that as used here, the word “farm” does not allow the reader to differentiate between land used to grow crops and land used to grow livestock. A farm is defined as “any place from which \$1,000 or more of agricultural products were produced and sold, or normally would have been” (NASS, n.d.). What follows is a consideration of one aspect of farming, that is, when the agricultural product under consideration is cattle, or in other words, ranching. In particular, this dissertation focuses on the differences and similarities between two ranching “communities” in Colorado. Rather than using the term community in the

traditional sense, two counties in northwestern Colorado will serve as a surrogate for community; Moffat County and Routt County.

Nationally, almost 34 million acres of agricultural land went out of production between 1982 and 2001, with just over 5.5 million acres (16.2%) of that land converted from pastureland (NRCS, 2003). In Colorado, 2.89 million acres of agricultural land has gone out of production since 1992, making Colorado third in the nation (behind Texas and New Mexico) for overall losses of agricultural land (Environment Colorado, 2006). If projections are correct, Colorado will lose another 3.1 million acres of agricultural land by 2022. Of the land in the State that is still classified as “agricultural,” 57 percent is devoted to cattle ranching (Environment Colorado, 2006).

Agriculture contributes to Colorado’s economy directly through the sales of products and is Colorado’s second largest primary industry (Environment Colorado, 2006). Colorado had 31,369 farms in 2002, up four percent from 1997, with livestock sales of \$3.3 billion dollars. Moffat and Routt counties in the northwest section of Colorado are two counties in which agriculture has always been an important part of the local economy and culture. Moffat County had 443 farms that averaged 2,297 acres, up 7 percent in the number of farms from 1997, with livestock sales of \$19 million in 2002. Routt County had 593 farms, up 14 percent from 1997, and livestock sales of \$23 million (National Agricultural Statistics Service, n.d.). Although the number of Colorado farms increased between 1997 and 2002, and that trend also existed for both Moffat and Routt counties, the total land in farms went down in two of the three areas. Moffat County experienced one percent increase in the number of

farms, but the number of farms was down ten percent in Routt County and four percent for Colorado as a whole. Regarding land use, farming and specifically livestock grazing is wide-spread. In Moffat County, livestock grazing is the most extensive land use (Comstock, 2006), and in Routt County, ranchers own over 500,000 of the approximately 850,000 acres of private land in the county (Environment Colorado, 2006).

Ranching also contributes to the State economy indirectly through tourism. Tourists to Colorado cite ranch properties as a primary factor in visiting some of the tourist areas of Colorado. Consider that in a recent survey, 46 percent of tourists to Steamboat Springs in Routt County stated they would find other destinations to visit if ranches in the area were converted to development. Researchers calculated that having ranches in the Steamboat Springs area provided an “agricultural image” that resulted in an additional \$7.5 million per year in tourist dollars for Steamboat Springs alone (Environment Colorado, 2006).

Ranching is an historic part of the New West, an important part of Colorado’s economy, and draws tourists to the area, whether it is because of the ranches themselves or the open space provided by ranches, but questions about the continued vitality of ranching abound. Concerns about depressed prices for their product and ever increasing prices for the components of livestock production tools required to run a ranching operation have caused many ranchers in the two counties to question whether they should continue ranching or quit in favor of what is often easier and more lucrative work. In addition, pressures from newcomers into this area of Colorado have been a factor in ranchers’ decisions to sell their properties.

Amenity development, which may be defined as population growth and movement into an area that is rich in natural amenities (e.g., warm winters, sun, mountain peaks, lush valleys, lakes, and rivers), has resulted in migration to areas like Park City, Utah; Jackson Hole, Wyoming; Aspen, Colorado; and Steamboat Springs, Colorado. In addition to the scenic and lifestyle features of amenity growth, another aspect of amenity development has to do with the types of people who are drawn to locations that are high on an amenity scale.

Amenity development is a term used to describe population growth into areas rich in natural resources. The newcomers to amenity rich regions often have higher levels of education than the local residents and more importantly, more wealth. This influx of new, wealthy residents affects the local economies by driving up property values and taxes, results in very large, expensive homes dotting the landscape, and can change the way a property is used. In addition, areas that are proximate to amenity growth areas may also be affected by amenity development. Thus, amenity growth research considers the affects that this type of development has on the affected community, but also highlights the ways areas that are proximate to the high growth community, sometimes known as bedroom communities, are affected. Amenity development affects the established residents, the new residents, and the surrounding environment, and as these factors converge, people's sense of their place in the community can be altered.

Routt County, Colorado is an amenity rich county while its neighbor, Moffat County, Colorado has few of the features that act as a draw for amenity growth. Both counties have a rich history in ranching, and although there are historic differences in

the two counties, these differences have been exacerbated by the influx of wealthy individuals into Routt County. This study will address the ways that amenity development affects residents in the two counties. Specifically, this research utilizes responses from a survey administered to approximately 700 ranchers and seeks to tap into the dynamics that take place by comparing a high amenity growth county, Routt County, to a county that is experiencing no growth, Moffat County.

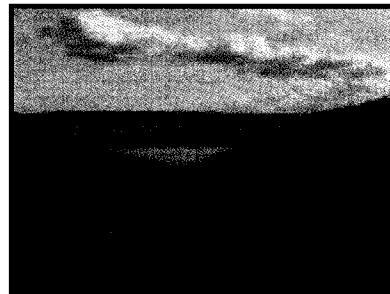
Development is a major factor in Colorado's changing landscape. "Large-lot rural homes," defined as homes on 2 to 40 acres, resulted in development that was three times the population growth rate between 1960 and 1990 and this "exurban" development is expected to increase by another 42 percent in the next two decades (Environment Colorado, 2006). This pattern also holds for this study area; 64 percent of land sold in Routt County between 1990 and 2001 went to amenity development (Environment Colorado, 2006).

April, 2006 listings for a variety of homes in Steamboat Springs, Colorado, an amenity growth area, included many homes for sale in Steamboat Springs that were between four and six thousand square feet and had prices starting at a million dollars. A similar search in nearby Craig Colorado, a non-amenity area, resulted in the identification of smaller homes for sale, none of which were larger than 3,000 square feet, and none listed for more than 450 thousand dollars (Steamboat Realty, 2006a; 2006b). In addition, the homes in Craig were often accompanied by large acreages, whereas the Steamboat Springs homes tended to be on relatively smaller lots. It is interesting to note the ways properties in the two counties are marketed. The websites for real estate focused on photographs of the larger homes in Routt County, whereas

Moffat County seemed to focus more on the property and less on the residence. These two properties give some idea of the differences in the marketing, sizes, and prices of properties in two counties:



Steamboat Springs, Colorado
5299 square feet
3.01 acres
\$3,295,000
Steamboat Realty
(Photo by Steamboat Realty)



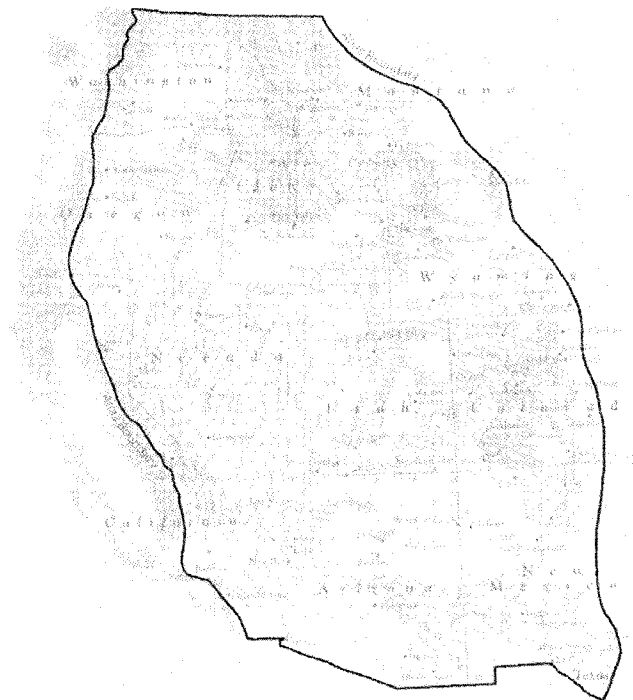
Moffat County
3601 square feet
405 acres
\$995,000
Steamboat Realty
(Photo by Steamboat Realty)

This research seeks to contribute to the sociological literature by 1) combining aspects of environmental sociology and the sociology of natural resources, and 2) introduces sociologists to permutation techniques for data analysis. More specifically, this study seeks to identify the role of ranching in northwestern Colorado by assessing people's beliefs, behaviors, and attitudes regarding ranching as a lifestyle. In addition, the survey results will be analyzed to discover whether there are differences in the experiences of ranchers in amenity versus non-amenity growth counties and second, to explore differences in the beliefs, behaviors and attitudes between new residents and long-term residents.

BACKGROUND

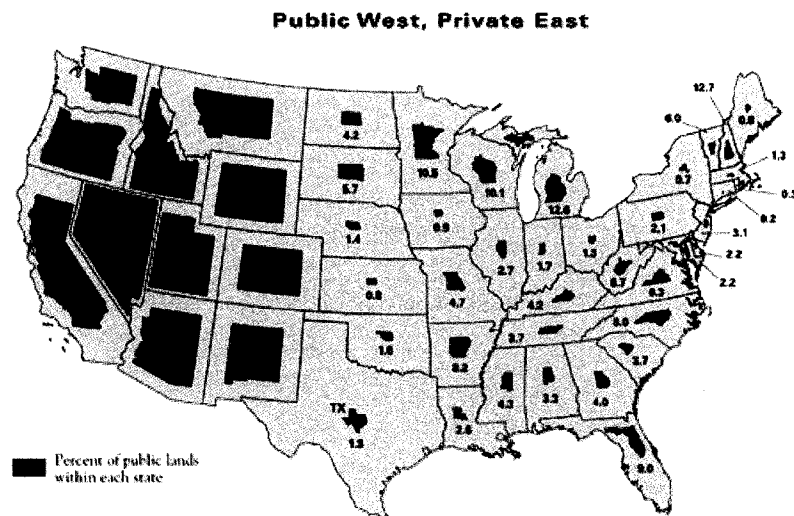
The American West is defined differently depending on the era. Early definitions included land west of the Mississippi, the land west of Cincinnati, and the land west of the 100th Meridian. Those definitions were refined to comprise the land west of and including the Great Plains, a definition that existed until relatively recently. The current classification of a “New West” varies slightly from the traditional “West” in that the western most area of the United States is considered as a separate. Identified in *Atlas of the New West* (Riebsame, Gosnell, and Theobald, 1997), researchers from the “Center of the American West” defined the New West as the area that lies between the Cascade and Sierra Mountains on the west, and the Great Plains on the east.

THE NEW WEST



The "New West." (Map reprinted from *Atlas of the New West*, Center of the American West, University of Colorado, Boulder, 1997, Riebsame, *et al.*, p.50.)

Much like the traditional West, the New West has two defining physical characteristics: aridity and extreme differences elevation (Riebsame, *et al.*, 1997; Rengert and Lang, 2001). In addition to these physical characteristics, the New West is also different than the East in an important way, land ownership. According to the Center of the American West, the U.S. government owns approximately half of the American West, a marked departure from the public/private land dynamic characteristic of the eastern half of the United States.



Public West, Private East (Map reprinted from *Atlas of the New West*, Center of the American West, University of Colorado, Boulder, 1997, Riebsame, *et al.*, p.58.)

The areas marked in green on the “Public West, Private East” map, areas that represent the amount of public land as a proportion of the total land area for each state. The states that comprise the New West have a much larger proportion of their total land that is public land than their counterparts in the east. In the east, six states have less than one percent of their total land area designated “public land,” and no state has

more than 12 percent public lands. Compare this to the west. Montana has the smallest percentage of public land for a western state at 28 percent and Nevada has the largest percentage at 82.9 percent (Riebsame, *et al.*, 1997, p.58). The physical characteristics of the New West, in combination with the public land dynamic, are integral to the discussion of ranching in the New West.

RANCHING

Ranching is an important, historic component of the American West, with two distinct faces. The romanticized portrait of “the cowboy” captured in legend and song is the Western epitome of the individual. The common perception is a cowboy lifestyle that includes long, hard, lonely hours riding the range. The cowboy is the face of individualism, American work ethic, and a free ranging spirit that has captured the minds and the spirits of people in the pages of novels, songs, and as “larger than life” heroes on the big screen. As evidence of the continued embrace of the cowboy lifestyle, consider that over 22 million people attended rodeos in 1995, and all 11 states that comprise the New West have a cowboy poetry festival, dude ranch, rodeo, or some combination of the three (Riebsame, *et al.*, 1997).

The rancher, on the other hand, may be thought of as an individual who enjoys extreme wealth. Ranchers are perceived as individuals who own enormous ranches that encompass miles rather than acres, and are portrayed as individuals who will go to any length to accumulate more. The rancher from the old television shows was always a powerful man, and even occasionally a powerful woman, but was also portrayed as someone who cared about his or her family, the workers on the ranch, and the people in the nearby communities. Movies, however, often portrayed a different type of

individual. The rancher was a man who accumulated wealth sparing no expense, whether it meant hurting the cowboys who worked on the ranch, the cattle, or the land. For many, the image of the cattle baron prevailing over everything he sees is the image that the word “rancher” conjures up.

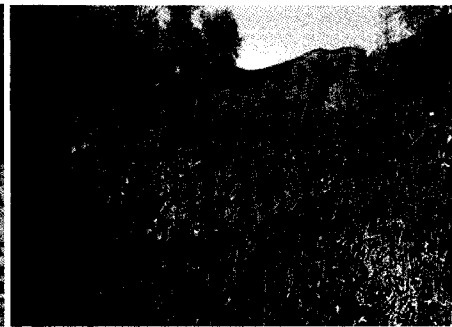
The contradiction between cowboy and rancher plays out in interesting ways in the public sphere. The public embraces the “idea” of the cowboy, but more and more denounces the rancher as an individual who profits at the expense of the environment (*Welfare Ranching*, 2002; Hudak, 2004; Rosenberger, 2005; *Waste of the West*, 2005). So while people still think of the romanticized “cowboy” when considering attributes such as individualism and hard work, “rancher” has come to embody greed and disdain for the land. Moreover, opponents of ranching have capitalized on the differentiation between the two by framing anti-ranching discussions around ranchers, the cowboy is never mentioned. In reality, this is likely due in part to the fact that the ranchers are “owners” and thus have control over the decisions on the ranch, but it does have interesting implications for the way the public understands the issues presented by anti-ranching contingent. In addition, debates about ranching in a public forum are due, in part, to the public land dynamic and the public’s sense of ownership of this land. Public land issues are important for this conversation for two reasons: (1) because ranchers may use public lands to graze cattle paying a nominal fee to the U. S. government or to the state and (2) ranchers have historically provided access to public lands through their land.

Grazing cattle on public lands has become a contentious issue as the number of people interested in outdoor recreation has increased. The opposition to public lands

grazing has an arsenal of weapons. *Welfare Ranching* (2002), a self-proclaimed “coffee table” book for example, is a graphic representation of the ways some radical, national-level environmental groups portray the “real” problems of ranching. The text is a collection of works by various authors with text that describes the groups’ interpretation of the problems of public land grazing and pictures that provide full-page, images of “the way it was,” i.e., the environmental conditions when cattle overgrazed the land, and “the way it is,” i.e., pictures of the land after cattle were removed from the system.



Tonto National Forest, 1992.



Tonto National Forest, 2000, reportedly taken from the same location. (Burgess, 2000).



San Pedro River, 1984. (Burgess, 2000).



San Pedro River, 1998.

Similar pictures accompany websites against grazing on public lands and all purport to be actual pictures of pre- and post-grazing. The images of Tonto National Forest and the San Pedro River (Burgess, 2000) are used to (reportedly) demonstrate the differences between land with cattle grazing and land without cattle grazing. While the accuracy of the images may be called into question, they do serve to garner the attention of people interested in the environment and more specifically, people who are vested in the idea of public lands without grazing. In addition, a variety of websites and “emagazines” denouncing public land grazing and calling for people to reclaim “their” land have emerged (cf. Hudak, 2004; “Range Restoration,” n.d.; Rosenberger, 2005; “Waste of the West,” 2005) and environmental groups have adopted “no grazing” stances as part of their mission statements (RangeNet, 2000, Sierra Club, 2000).

Some ranchers and ranching organizations have responded to environmentalists by noting that ranchers depend on the condition of public lands to produce food not only for the people in the United States, but for a global market place, and therefore ranchers are committed to being good stewards of the land (NCBA, 2005). In particular, the National Cattlemen’s Beef Association (NCBA) argues that cattle are a land management tool used to minimize problems associated with exotic plant species and wildfires. While acknowledging abuses have occurred, the NCBA cites findings from the Bureau of Land Management (BLM) and a report in “Natural Resources for the 21st Century” that argue significant improvements in rangeland during the 20th Century are a result of ranchers’ stewardship. The attention to stewardship has been accompanied by the NCBA’s adoption of a “resolution of

stewardship beliefs” and an Environmental Stewardship Awards Program (NCBA, 2005).

Debates about the use of public lands are not unique to a contemporary discussion of ranching. Even as the West was being settled, people questioned whether cattle should be included on federal lands (c.f., Donahue, 1999). Since then, the discussion has grown to include more stakeholders as traditional outdoor activities such as cross-country skiing, hunting and fishing, and camping have been augmented by outdoor activities such as snowmobiling, motorcycling, rafting, kayaking, and exploring public lands in 4-wheel drive and all-terrain vehicles. It is also important to note that controversies surrounding the use of public lands for grazing are not the only issues ranchers face.

Historic problems associated with wildfires, insects, and droughts still affect ranchers. In Colorado, for example, by the summer of 2002 a seven year drought had caused some ranchers to sell off much or all of their herds (AP, 2002a; Garner, 2002; Long, 2003; Meadow, 2002; Sanders, 2002). Those who remained had to deal with reductions in available forage as the amount and quality of vegetation decreased, were threatened with removing cattle from federal grazing because of the fragile conditions of the public lands, and further, watched as a grasshopper infestation consumed what the drought had not. Colorado ranchers had no choice but to buy hay at exorbitant prices, up from \$80 a ton (the price in a normal year) to \$200 a ton and trucked in from as far away as Wisconsin (AP, 2002b; Bacon, 2002; Crowl, 2002; Kennedy, 2002; Phillips, 2002). In addition, stagnant prices for beef accompanied by increasing

prices for land, equipment, and feed have caused some ranchers to wonder whether the lifestyle is worth the current price (AP, 2001; AP, 2002c; Long, 2003).

Rangeland use controversies and environmental degradation are just two of the issues facing ranchers in the new century. Amenity growth and a lack of heirs are also potential factors in the calculus ranchers consider when making decisions about whether to continue ranching. Ultimately, however, the issue of ranching in Routt and Moffat counties comes down to, “what role should ranching play in the New West”? On the one hand, some would argue the continuation of ranching would maintain the traditions and lifestyles of the old west, preserving in some sense, cultural traditions that are as old as the West itself; maintaining ranch properties preserves open space and migration patterns for native grazers; and helping to manage the ecosystem by controlling noxious weeds. Others might suggest, however, that ranching is passé and inefficient, therefore adopting more contemporary land uses would benefit the ranchers and the community.

RURAL SOCIOLOGY

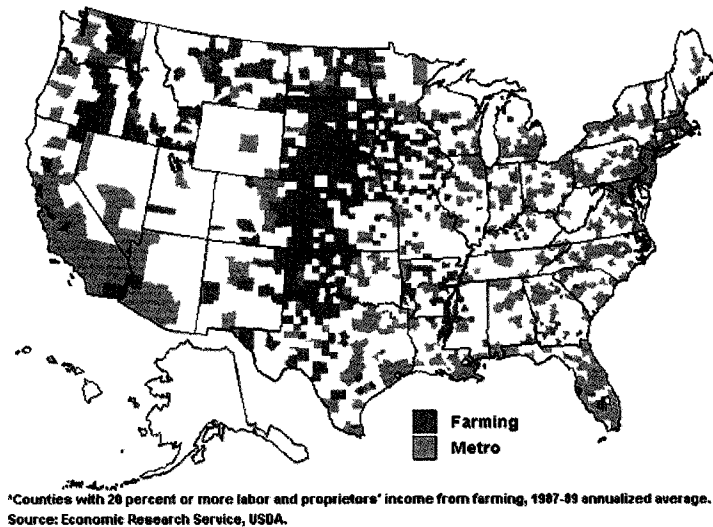
Rural sociologists have a long and demonstrated interest in rural life and agriculture. A rich literature has developed resulting in a variety of theses regarding gender and farming, environmental issues and farming, the farm and farm families in transition, rural life and poverty, and globalization and farming (see, for example, Beale and Johnson, 1998; Blank, 1998, 1999; Bonanno, Busch, Friedland, Gouveia, and Mingione, 1994; Buttel, 1992; Cook, 2000; Elder, Robertson, and Foster, 1994; Glasgow and Brown, 1998; Jackson-Smith and Gillespie, 2005; Lobao and Meyer,

1995, 2001; Lobao and Schulman 1991; McMichael, 1994, 2003; Meyer and Lobao, 1994, 2003; Public Citizen, 2001; Swanson, 2001a, 2001b; Zollinger and Krannich, 2002;). In spite of the tremendous amount of research this area has generated, however, it is less comprehensive than one might expect.

The attention to farming has resulted in a geographic focus that has concentrated much of the rural research in the farm-rich areas of the midwestern and southern United States. Although recent work in rural sociology has started to consider issues pertinent to the New West, issues such as amenity development (e.g., Brehm, Eisenhauer, and Krannich, 2004; Hunter, Boardman, and Saint Onge, 2005) there is still a gap in the rural literature on both ranching and the American West. Moreover, this research focus has subsumed ranching, when it is included, into the farm and the two treated as though the dynamics that affect farmers and ranchers are the same. Therefore, much of the literature that deals with rural issues is more concerned with farming than ranching.

The following map from the Economic Research Service/USDA (ERS, 2002) specifically considers farming-dependent counties, and provides a map depicting areas of farming (in green) and metro (the blue area). Conspicuously absent is any mention of ranching. More importantly, however, is what the area in white on the map makes palpable. The “nonmetro farming-dependent counties” map graphically demonstrates that much of the New West, especially states such as Arizona, California, Nevada, Utah, and Wyoming, is removed from the discussion of farming.

Nonmetro farming-dependent counties, 1989*



Source: Economic Resource Service, 2002

Thus although ranching is implied in the ERS discussion of farming only because it is not excluded, there is no manifest consideration of ranching or of the areas that are dominated by ranching communities. There are, however, substantive differences between farming and ranching that should be explored. One important difference is the public perception of the rural productive activity. In general, society embraces farming and farmers as holders of traditional American values but ranchers do not enjoy the favorable niche that farmers do. Farmers are perceived as stewards of the land. Ranchers, on the other hand, are typically portrayed as exploiters of the land and the natural resources contained on that land. One might suggest that radical environmental groups have attempted to take advantage of ranchers' cultural weakness to further delegitimize the ranchers as people and ranching in general. Moreover, the differences in public perceptions of ranching and farming matter, since ranches in the west tend to be located in the West and much of that area of the U.S. comprised of public lands.

The prevalence of public lands in western ranching is an important dynamic because public lands are ubiquitous in the west but relatively unknown in the east, and because of the intersection of public lands and high amenity areas. The geographic focus of the sociology of agriculture literature highlights the Southern and Midwestern United States; therefore, there is relatively little sociological literature on the public land dynamic. This results in a variety of land use questions that are specific to the West that have not been addressed in sociological research. This difference in land ownership involves a variety of stakeholders in a way that farming does not, and this is integral to understanding ranching communities.

Finally, amenity growth in the west is a key difference. Amenity growth is becoming an important factor in areas that are historically ranching communities. Similar pressures are either nonexistent or are much smaller in affecting farm communities.

Given the common public perception of ranching, it is important to tap into ranchers' beliefs and behaviors in order to present a balanced assessment of ranching in the West. There are a number of reasons to be interested in ranchers' opinions. First, the opinions of all actors in any discussion are important. Second, ranchers are intimately connected to the land and have an organic knowledge of land conditions as well as what does not. Although ranchers may sometimes act in ways that are inconsistent with these beliefs, those decisions are predicated on economic or policy conditions. Thus, understanding ranchers' beliefs, behaviors, and attitudes is an avenue towards good policy decisions that do not have an effect that is the opposite of what was intended by the policy. Ranchers are culturally important. People in the

United States embrace the idea of the old west and keeping ranches in the West is similar in theory to preserving historic buildings that are a part of the culture. Unlike buildings, however, preserving ranches protects open space, wildlife, and contributes to the economy through tourist dollars.

PUBLIC LANDS AND GRAZING

Over 700 million acres of land in the New West are public lands. These include all lands owned and managed by the federal government, state governments, and local governments. At the federal level, lands are managed by the Department of the Interior, the U. S. Department of Agriculture and the Department of Defense. According to LaFrance, Shimshack, and Watts (2003, p. 1), livestock grazed on 167 million acres managed by the Bureau of Land Management and an additional 95 million acres were administered by U. S. Forest Service in 2003. Public lands were created to provide Americans with lands that would not be developed or privately owned, thereby providing open space for generations of people. Early on, however, grazing non-native species, i.e., cattle was also a component of public lands. The use of these public lands for grazing is historic, but so are the debates about that use.

The 1862 Homestead Act enticed settlers to the West and that same year, stock growers lobbied for legislation that would simultaneously provide for cattle producers to lease public lands for grazing while at the same time, preventing or minimizing intrusion into those lands by homesteaders (Donahue, 1999: 12). Shortly after the Homestead Act passed, scholars and government botanists cautioned against uncontrolled grazing, calling alternatively for restricted access for livestock and improving the condition of the western landscape through the planting of native

grasses and plants (Donahue, 1999). In spite of this early concern, grazing on public lands continued and finally, was formalized through a fee structure; with fees instituted for forestland in 1906, followed by the Taylor Grazing Act (1934), and grazing fees for non-forest public lands (1936).

The issue of what constitutes an appropriate use of public lands, particularly in the New West, is a volatile one. Though the practice has always been controversial even historically, the use of public lands for grazing has come under increasing scrutiny over the last 20 years as environmentalists question the impact of this practice on western lands. Further, where much of the early debate centered on riparian areas, discussions about environmental degradation have since come to include areas that were often thought of as having no intrinsic value, especially the more arid regions common in the west. The current debate centers around changing the administration of public lands, from rethinking the policies that dictate how many animals are allowed to graze a parcel, to how much to charge ranchers for the use of that land, to removing cattle from the land entirely (Bovee, 2001; *Welfare Ranching*, 2002; LaFrance, Shimshack, and Watts, 2003; Hudak, 2004; Rosenberger, 2005; *Waste of the West*, 2005).

In addition, increases in the numbers and types of people who use public lands for recreation, increases in the number and types of environmental organizations, a new appreciation of the importance of moraine, and a more mobile and informed public have all expanded public interest in public lands. There are more active stakeholders in the public land debate than at any time previous, and these

stakeholders have the potential to affect changes in public land use in ways that are unparalleled in U.S. history.

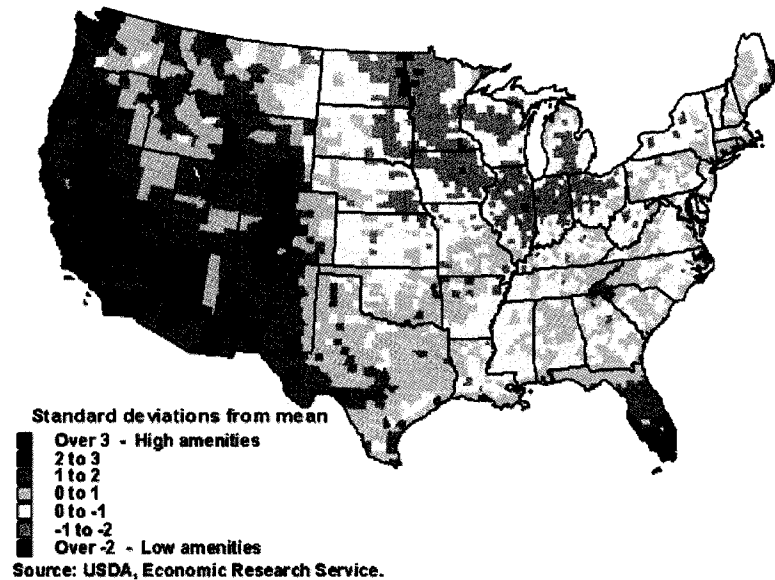
AMENITY GROWTH

As mentioned previously, amenity growth describes population growth into areas that score high on the natural amenity scales. This type of growth brings a variety of pressures to both the county in which the growth is occurring and to neighboring counties. Krannich and Petzelka (2003, p. 190) cite six factors that encourage amenity growth including “warm winters, winter sun, temperate summer, low summer humidity, topographic variation, and water areas.” Population in counties that rated high on these six factors grew by an average of 125 percent between 1970 and 1996, whereas counties that scored low on the scale had average population growth of one percent (Krannich and Petzelka, 2003; McGranahan, 1999).

In areas where this growth pattern is well established, land values in the high growth area have steadily risen and development pressures have increased. New residents in amenity communities tend to be relatively wealthy and therefore, increases in spending in the communities as well as increases in the tax base can be a boom for the local economy. Contiguous non-growth counties also experience increasing population. In the case of the latter, however, the growth is characterized as being comprised of people who provide services for the amenity community but cannot afford to live there and are looking for affordable alternatives. Thus, these contiguous counties are faced with the attendant problems associated with growth but are not afforded any of the positive aspects of growth, i.e., increases in the tax base. In addition, the rapid growth in these areas results in alterations to the countryside and

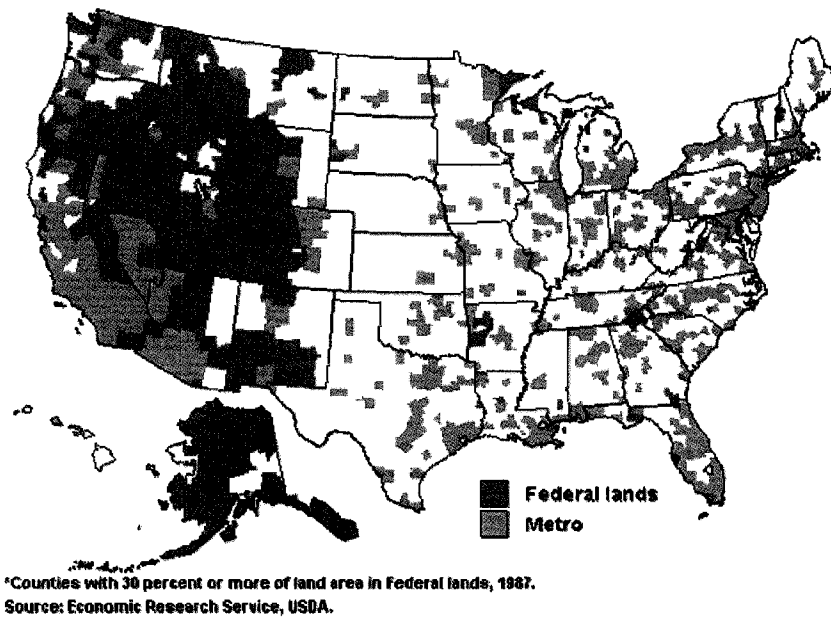
the way land is used. These changes are primarily marked by subdivisions and the development of ranchland, and an increase in the number recreationalists.

Natural amenities scale



Source: Economic Research Service, 2004

Nonmetro Federal lands counties, 1987*

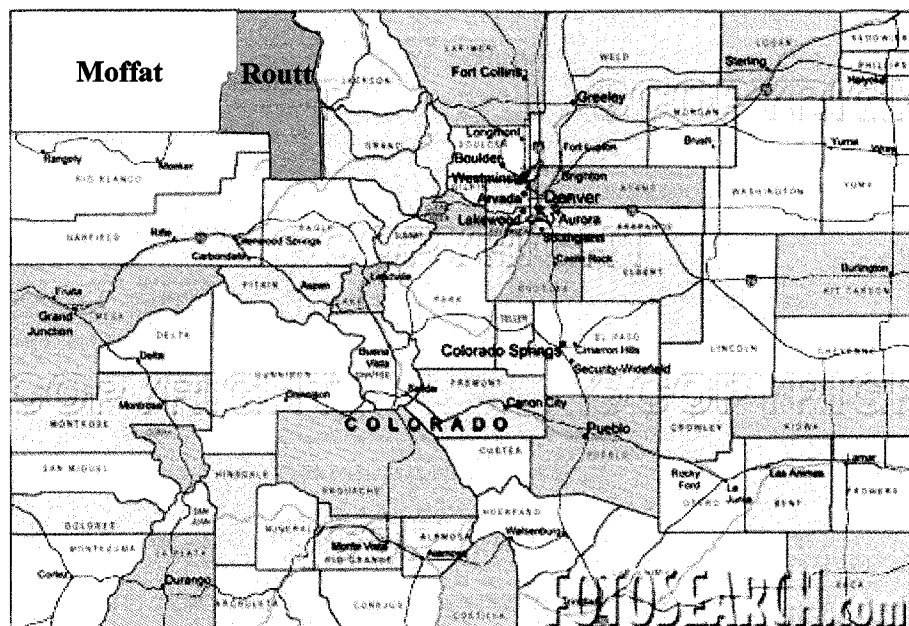


Source: Economic Research Service, 2004

There is an interesting parallel between amenity growth areas and public lands. Amenity value is measured by a variety of factors, including mean temperature, humidity, and topography (McGranahan, 1999; Krannich and Petrzela, 2003). The geographic and environmental factors that result in high amenity scores predominate in the West. Therefore, the western United States has a much higher overall amenity score than the Midwest or East, and it is also the area of the country with the most public land. The overlap in counties with 30 percent or more of their land designated as federal (public) land and those counties that rate high on natural amenities is striking, and integral to the study of ranching there.

THE STUDY AREA

This study explores changes in ranching in Routt and Moffat counties, Colorado. The Colorado Territory was established February 28, 1861 and on September 9, 1861 the first Legislative Assembly of the Territory established 17



Map adapted from fotosearch.com, 2003

counties. The State of Colorado entered the Union five years later, August 1, 1876, and Routt County, with Steamboat Springs as the county seat, was established a year later. In 1911, Routt County was divided into two sections which allowed for the establishment of Moffat County, with Craig designated as the county seat (D'Addezio, 2005; Information Please, 2005).

Routt and Moffat counties provide very different challenges rooted in quite disparate conditions (Moffat County is pictured in yellow and Routt County in blue on the map above). The two counties are contiguous, with Moffat County bordering Utah on its western edge and Wyoming to the north, while Routt County is bordered by Moffat County to its west, Wyoming to the north, and Jackson and Grant Counties to the east. The two counties are also very dissimilar with respect to the type of terrain and available water.

In terms of area, Moffat County is slightly more than two times larger than Routt County; Moffat County encompasses 4,743 square miles whereas Routt County covers 2,362 square miles. Routt County, however, has a larger population base. According to the U.S. Census, the estimated population for Moffat County in 2004 was 13,468, a +2.2 percent change over the 2000 census. The population of Routt County, on the other hand, was estimated to be 21,012 with a +6.7 percent change for the county. The two counties are also quite different when compared for topographic features.

The following photographs were taken in the two counties. Each picture was taken on May 24, 2005. The pictures were all taken from Colorado Highway 14 moving from west to east through Colorado. The first and second pictures were both

taken in Moffat County. Picture one was taken at mile marker 1 and is a southern view of the area upon entering western Moffat County from the Utah border. The second picture is also a southern view of Moffat County at mile marker 41. It is interesting to note that over the 41 miles between the two pictures, there was no evidence of any cattle in the area and only a handful of mailboxes indicated occasional inhabitants. The country appeared to be arid, relatively flat, and treeless.

The third and fourth pictures were taken at the western edge and middle of Routt County. The third picture was taken from the eastern edge of Moffat County at mile marker 86, looking due east into Routt County, Colorado. The fourth picture is a view of Routt County, looking south of the highway, at mile marker 118. Routt County was quite varied in its terrain and exhibited many more types of plant life, homes were more apparent, and evidence of ranching was more apparent.

EASTERN EDGE OF MOFFAT COUNTY



Moffat County: Mile Marker 1
Photo by Johnston, May 24, 2005

MIDDLE PORTION OF MOFFAT COUNTY



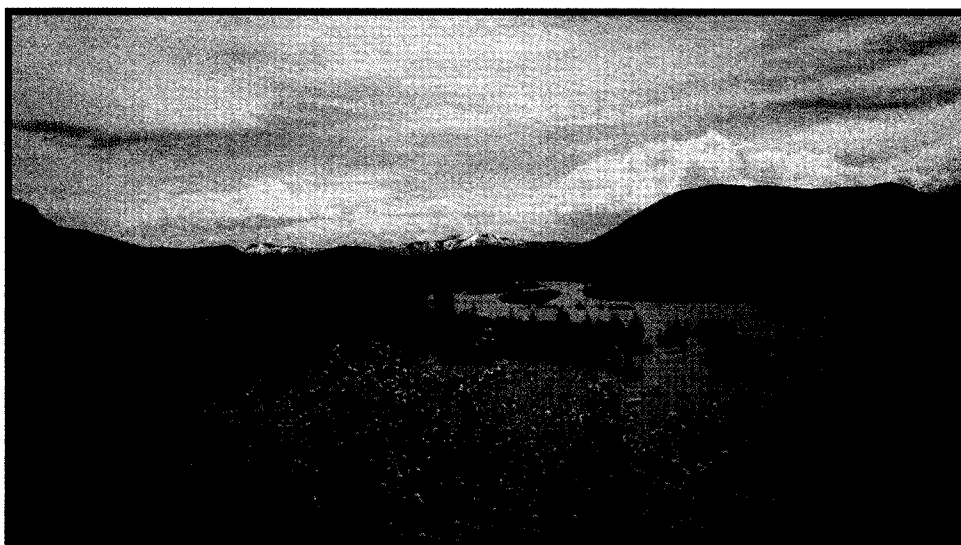
Moffat County: Mile Marker 41
Photo by Johnston, May 24, 2005

EASTERN EDGE OF ROUTT COUNTY



Routt County: Mile Marker 86
Photo by Johnston, May 24, 2005

MIDDLE PORTION OF ROUTT COUNTY



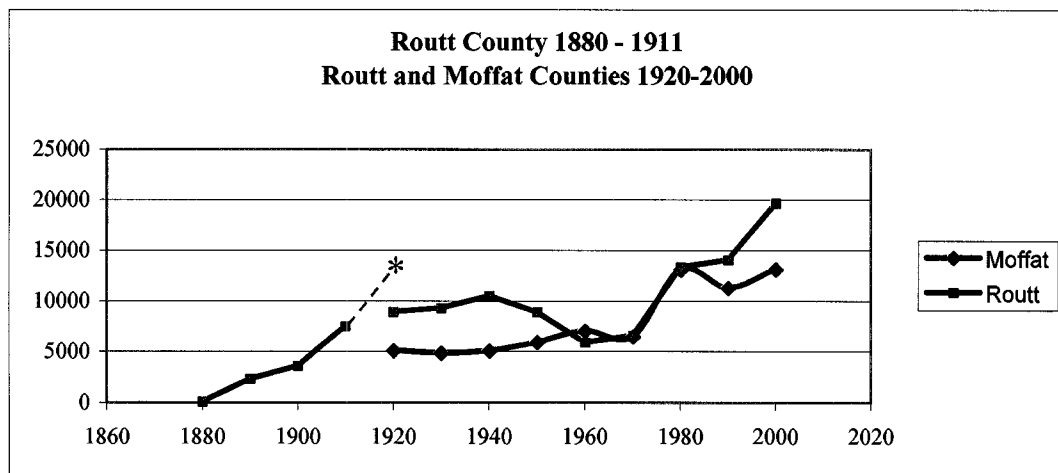
Routt County: Mile Marker 118
Photo by Johnston, May 24, 2005

The photographs provide evidence of the differences in the natural amenities in both of the counties. Moffat County is low on natural amenities; it consists of high plains, is arid, and there are very few stands of trees. Routt County is located in a mountainous region, the Yampa River runs through the county, and trees dot the landscape. The fourth picture shows the Yampa Valley, and while it is important to note that this springtime view of the Yampa River is not typical (many of the rivers in Colorado and Utah were at, or approaching, flood stage in May), it is equally important to note that the much drier conditions depicted in Moffat County were occurring at the same time.

These pictures help to demonstrate the sharp contrasts between the two counties not only with respect to aridity, but the other features that affect amenity growth; varied terrain, forests, and water. Thus, while the two counties are both home

to historic ranches, the development patterns of the counties and the experience of ranchers is quite different.

Moffat and Routt Counties have traditionally experienced different population and economic growth patterns; however the last twenty years has increased historic differentiation between the two counties. Prior to 1911, Routt County was a large county with 7,561 people reported in the county during the 1910 census (University of Virginia Library, 2005). After 1911, Routt County was divided into two counties and Moffat County was created. In its first census (1920), Moffat County reported 5,129 residents in the county. Between 1920 and 1960, Moffat County's population remained fairly constant; 4,861 in 1930, 5,086 in 1940 and 5,946 in 1950 compared with Routt County for the same period; 9,352 in 1930, 10,525 in 1940, and a decrease in the 1950 census to 8,940 individuals.



The 1960 census indicates that the population of Moffat County surpassed Routt County, with 7,061 residents in Moffat County and 5,900 residents in Routt County. In 1970, Routt County's population continued to decline (with a population of 6,525) and Moffat County's population continued to increase (6,592 residents). By

1980 both counties were growing significantly, having doubled their populations from the previous decade; Moffat County had 13,133 residents while Routt County had 13,404 residents. At this point, the two counties diverged once again with Moffat County's population decreasing in the 1990 census (11,357) and finally increasing to 13,184, or just about where the county population stood in 1980. Routt County, on the other hand showed a population increase over the two decades between 1980 and 2000 with 14,088 residents in 1990 and 19,690 residents in 2000 (University of Virginia Library, 2005).

Moffat County's population was virtually unchanged in the last two decades of the 20th century with a net population change of 51 residents or a 0.04 percent increase. Conversely, Routt County's population increased by 5,602 or 39.76 percent over the same period, and information regarding educational attainment and income suggests that the growth followed an amenity growth pattern.

As noted previously, amenity development is characterized by individuals with higher incomes and educations than traditional populations. A comparison of the two counties resulted in the following:

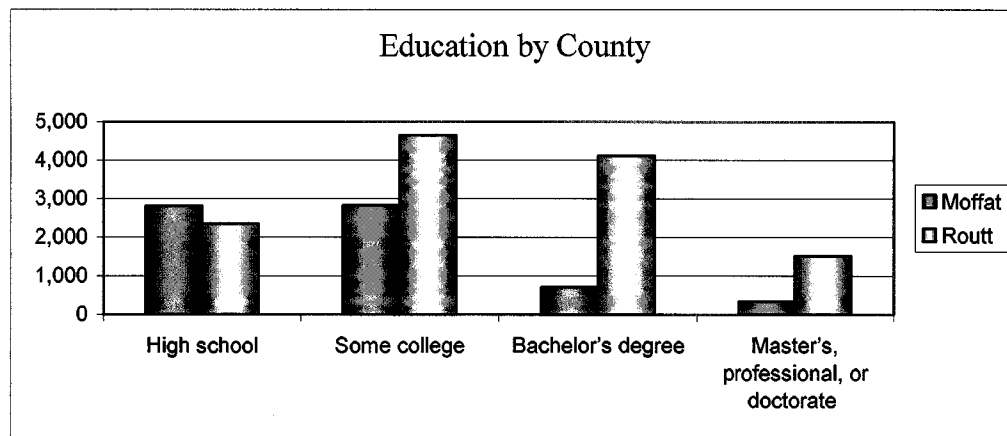
2000 CENSUS DATA: INCOME AND EDUCATION

	Moffat	Routt
Population	13,184	19,690
Median household income	\$41,528	\$53,612
High School	2,812 (33.5)*	2,347 (17.7)
Some College	2,832 (33.7)	4,653 (35.1)
Bachelor's degree	708 (8.4)	4,121 (31.1)
Master's, professional, or doctorate	339 (4.0)	1,519 (11.4)

* Numbers in parentheses are percentages

Source: ePodunk Inc. 2006

The differences in education are striking when the data are presented graphically, although it should be noted that Colorado Mountain College is located in Steamboat Springs and therefore the number of respondents with some college (which includes the two-year associate's degree) may be artificially high.



Source: ePodunk Inc. 2006

Interesting questions arise when one considers the dynamics of ranching in the New West and the factors that ranchers face in the new millennium. Are amenity growth counties and non-amenity growth counties facing similar pressures with regard to ranching? Are changes in the population in the New West affecting ranchers, and if they are, are the changes experienced differently in amenity growth and non-amenity growth counties? Are ranches, in general, a negative influence on the environmental condition of the land? Do ranchers consider themselves to be good stewards of the land, and if so, is there a difference between ranchers' beliefs and ranchers' behaviors? These, among other questions are the concerns of what follows.

This study seeks to answer these questions utilizing a survey that was conducted in 2002 entitled *Ranching and farming in Colorado: Understanding the*

challenges facing landowners and operators. The responses from this survey will be analyzed by combining aspects of environmental sociology and the sociology of natural resources, specifically considering the beliefs, behaviors, and attitudes of respondents employing the theories of Fishbein (1963, 1967a, 1967b), Ajzen and Fishbein (1977) and Ajzen (Ajzen, 1991, 2001) and tapping into how respondents feel about their communities. Broadly, the responses from residents in the two counties will be compared to learn if respondents in the two samples share the same beliefs, behaviors and attitudes. The data will be analyzed to see if there are similarities in beliefs but differences in behaviors. The data will also be explored to determine whether differences exist between old residents and new residents. Finally, the answers provided by respondents will be analyzed to see if amenity growth has affected how they feel about their communities.

CHAPTER TWO

BRIDGING ENVIRONMENTAL SOCIOLOGY AND THE SOCIOLOGY OF NATURAL RESOURCES

This chapter introduces the general sociological frameworks of Merton's theories of the mid-range associated with both the natural resource and community studies literature and 'reasoned action' and 'exchange theories.' Sociological inquiry on natural resource extraction tends to give emphasis to conceptual frameworks developed from available secondary data sets and those developed for specific interactions between society and local ecosystems. Exchange theory also tends to have more pragmatic foci on specific issues that are generated from government and non-government contracts or competitive research programs. More formal macro-sociological theory is found in literatures associated with environmental sociology. These distinctions with this very broad literature are addressed below. In addition, the differentiated literatures beg a broader sociology of knowledge question of why these distinctions emerged. In part, these distinctions are embedded in the U.S.'s cultural legacy of at least initially giving primacy to extractive relationships with nature, only to be balanced by the late 19th century cultural shift to an awareness of the importance of nature as an independent entity.

Historically, the American cultural framing of human relationships with its myriad ecosystems has privileged extraction over preservation. Consequently, the

natural environment tends not to be separated from associated social environments.

The late 19th and early 20th century concerns of John Muir (e.g., see, Muir, 1890, 1896, 1897) and Aldo Leopold (e.g., see Leopold, 1925, 1987, 1993) and the emergence of environmental social movements and non-profit organizations create a dialogue on the relationship between humans and the environment and associated ethical and economic concerns. By the 21st century American cultural framing of this relationship continues to give privilege to resource ‘wise use’ but with a substantial concern for something to be protected.

Evidence of these distinctions and cultural transformations exist among U.S. ecosystems public policies. The first national park, Yellowstone National Park, was created March 1, 1872 to set aside 3,300 square miles of land that could neither be settled nor privately owned, “issuing in an era of conservation” (National Park Service, 1997: 22). Some years later, William Mulholland, head of the Los Angeles Water District in the late 1800s and early 1900s, visited Yosemite National Park (1890), and suggested that if he were in charge, photographers would create books with photos of Yosemite in all seasons and times, and when the work was done, he ““would build a great dam and stop all the goddamn waste”” (Learnmonth, 1997). These two examples of human considerations of the environment represent extreme characterizations of environmental extraction and stewardship. It is not surprising that this cultural heritage might be expressed in American Sociology’s general environmental literature. Buttel (1996, 2002) and others (Belsky, 2002, Dunlap and Catton, 2002; Field, Luloff, and Krannich, 2002; and Rudel, 2002) note subdisciplinary foci on environmental studies that differentiates between

environmental sociology and the sociology of natural resources: Environmental sociology is focused more on *protection* (i.e., preservation of the environment, especially in pristine environments) of the environment, and the sociology of natural resources is focused more on the *use* of components of the environment. This substantive focus distinction in the literature will be folded into the chapter's general theoretical presentation.

SOCIOLOGICAL THEORY

Of all our many approaches to social behavior, the one that sees it as an economy is the most neglected, and yet it is the one we use every moment of our lives—except when we write sociology. George C. Homans (1958).

The theoretical perspective guiding this research is a combination of concepts drawn from three, generally separate areas of study. Specifically, elements of the theory of reasoned action, exchange theory, and community studies will be considered to explain beliefs, behaviors, and attitudes among ranchers in northwestern Colorado. Community studies literature includes the rich traditions of the sociology of natural resources and because this research focus on two counties – communities conceived largely — the community studies literature will inform this dissertation. The theory of reasoned action is more often identified with environmental sociology; this theoretical perspective will draw from both environmental sociology and the sociology of natural resources. Exchange theory, a derivative of rational choice theory, will enhance the ideas that underlie the theory of reasoned action.

In order to locate environmental sociology and the sociology of natural resources within the larger discipline of sociology, the three, distinct levels of

sociological theory; macro-theories, mid-range theories, and micro-level theories are considered. As a very general description, macro-theories seek to engage in “big-picture” questions, tend to be highly theoretical, and, in general, are not concerned with informing policy. Theories of the middle range (Merton, 1949) blend theoretical and applied aspects of sociology and are more focused than macro-theories, providing a stronger relationship between theory and practice than is typically found in a macro theoretical approach. An important distinguishing characteristic between macro theories and mid-range theories are the types of data that are employed. Mid-range conceptualizations utilize empirically-generated perspectives that often are not elements of macro-theoretical inquiries.

Merton (1949) academically legitimized these middle-range studies as a truly American epistemological phenomenon. The inherent pragmatism is consistent with the larger philosophical tradition of pragmatism in the U.S. This approach moved U.S. sociological thought away from European sociology with a unique blend of pragmatism and praxis. Theories of the mid-range are also evident among micro-level theories, such as social psychology or symbolic interaction that examine small group behavior. These microsociological studies are generally concerned with face to face encounters and small-scale interactions. The unit of analysis for micro-level theory is typically the individual or small group, but community dynamics might also come under the purview of micro-level theory.

Environmental sociology is generally considered to be broader and more encompassing than the sociology of natural resources and as a result of this broad focus, environmental sociology is more often considered a macro theory. The unit of

analysis for macro theory is typically at the level of the nation-state, although environmental sociology is also concerned with even broader analyses, considering global-level questions (Buttel, 1996). Thus, problems of pollution, scarce resources, environmental degradation, environmental sinks, repositories, living space, global warming, the ozone hole, deforestation, modernization, and risk are included in the topics generally considered by environmental sociologists (see, for example, Adam, 1998; Beck, 1998; Catton and Dunlap, 1978; Carolan, 2005; Chiotti and Johnston, 1995; Clark and York, 2005; Dunlap and Catton 1979, 2002; Eder, 1998; Jamison, 1998; Machlis, 1992; Routhe, Jones, and Feldman, 2005; Szerszynski, 1998; Trumbo and O'Keefe, 2005; Warren, 2005; Wynne, 1998). These concerns are addressed theoretically in order to explain degradation, not to inform policy.

The sociology of natural resources, on the other hand, has a tradition of dealing with issues endemic to a particular region and thus is a more a mid-range theoretical perspective. The unit of analysis is often a community or well-defined area of relatively limited scale, and the focus is typically rural. Practitioners within the sociology of natural resources often engage in sociological studies with the intent of providing input during policy development. The combination of a rural centered, policy orientation has resulted in a focus on community studies, farming and ranching, farm families, poverty, race and ethnicity, and policy (Chafel and Neitzel, 2005; Friedland, 2002; Hunter, Boardman, and Saint Onge, 2005; Jackson-Smith, 2003; Jensen, McLaughlin, and Slack, 2003; Johnson, 2003; Lobao, 1996; Lobao and Meyer, 2001; MacTavish and Salamon, 2003; Saenz and Torres, 2003; Spano and Nagy,

2005; Rigg, 2006). As a function of this focus, the sociology of natural resources tends to be less theoretical than environmental sociology (Buttel, 2002).

The scope of the physical terrain that environmental and natural resource sociologists study informs the depth at which discussions take place. Thus, where environmental sociologists are generally engaged in describing large-scale problems in general terms, sociologists of natural resources tend to provide detail and specific suggestions for particular issues or locations. The terrain is also defined differently if one considers the natural environment. Environmental sociology tends to position people *within* the environment, positing that humans are a part of the environment and, for the most part, have had a negative effect on it. Thus, the focus of much of the work done in environmental sociology is on problems created by people and further, what people can do to change their impacts on the ecosystem.

The sociology of natural resources positions people more as actors *on* the environment. Rather than conceptualizing the holistic environment, the sociology of natural resources frames questions around individual elements or groups of elements that comprise the environment; components that are conceptualized as resources. Thus land and water become identified more as tools that exist to be used by people, than components that maintain a separate environmental existence. This is not to suggest that researchers within the sociology of natural resources are not environmentally conscious, however. An historic and recurring theme in the sociology of natural resources research involves the wise use of resources and protection of the environment.

The following section elaborates on both the sociology of natural resources and environmental sociology, and concludes with a suggestion that environmental sociology and the sociology of natural resources need not be completely separate. A conceptual tie is identified that bridges these two subfields of sociology.

SOCIOLOGY OF NATURAL RESOURCES

The sociology of agriculture literature recognized at its inception in the 1970s (Buttel and Newby, 1980; Buttel, Larson and Gillespie, 1990) that natural resource use and associated social issues were important to inquiries on the environment.

Sociologists concerned with rural issues focused on the family farm and considered a range of issues that dealt with resource use as well as issues of community (see Buttel, Larson, and Gillespie (1990) for a discussion of early contributions to the sociology of agriculture). As the sociology of agriculture literature unfolded, research moved towards food and food safety issues and a separate branch that continued to focus on natural resources developed.

The sociology of natural resources predates environmental sociology by a little more than a decade. Its origins can be traced to the establishment of the Rural Sociological Society (1937), although earlier research can also be identified as focused on natural resource issues. Donald R. Field, A. E. Luloff, and Richard S. Krannich (2002) reported that the earliest specific consideration of natural resources appeared in the area of rural sociology in the early 1900s with social researchers such as Warren Wilson (1912) and Charles Galpin (1915) utilizing spatial variables in their studies of farming, and Alva Benton (1918) writing about social organizations and soil depletion relative to farm communities (see Field, et al., 2002 for a complete discussion).

Among the early books on rural sociology was a text by Pitirim Sorokin and Carle Zimmerman (1929) which specifically identified rural sociology as the focus of the book, *Principles of Rural-Urban Sociology*. The authors expressly noted that their book was intended to be “a rural sociology” rather than “a mere collection of various data pertaining to aspects of rural life and rural communities” (pg. v). The Sorokin and Zimmerman text synthesized a three-volume work by Sorokin, Zimmerman, and Charles Galpin, Volume I of which appeared in 1930 as the *Systematic Source Book in Rural Sociology*.

Sociologists working in American universities and especially those working at Land Grant Universities’ Colleges of Agriculture with Experiment Stations expounded on aspects of rural society focusing on social relations among residents in rural communities with much of that focus on farms and families (e.g., Kolb, 1933; Lively, 1932; Zimmerman, 1930) and it is in these works that the essence of the sociology of natural resources began to evolve. For example, work begun in the late 1920s and early 1930s discussed geographical features and how such things as topography and the existence of roads affected the potential for sociality (see, for example, Kolb, 1933). Additional work focused on rural institutions (family, schools, and churches). While focusing on traditional sociological subjects e.g., social institutions and demographic data, these early works also often incorporated a natural resource component such as soil erosion.

The Rural Sociological Society formed to specifically consider rural issues. With the creation of the society came an increase in sociological publications on rural issues, and especially, family farming. Additional areas developed that provided

research avenues into community structures, agriculture, family, and policy issues that affected individuals in rural areas. Early integration of natural resource issues into rural sociological academic inquiry eventually resulted in the formation of a research group that focused specifically on resources, the natural resources research group (NRRG, est. 1963). The NRRG first appeared as a product of work in schools of agriculture and as a function of working with other organizations, especially governmental organizations such as U.S. Forest Service, the U.S. Department of Agriculture, and the Corp of Engineers. Moreover, early researchers had an organic association with their research. The researchers themselves came from rural communities and farms, making a ‘natural’ connection natural resource issues.

In addition, funding opportunities and support structures gave researchers in the sociology of natural resources myriad opportunities for funded research. Organizations such as the U.S. Department of Agriculture and within that organization, the Economic Research Service, provided opportunities for researchers to develop research agendas that resulted in a large body of work on rural issues. Natural resource sociology considered not only extractive industries, but also focused on environmental conditions that affected rural communities. This long-standing tradition of research that effects policy and community decisions continues into contemporary research designs, especially within Land Grant Universities.

The early attention to agricultural policy and rural communities is also reflected in the contemporary literature by sociologists who focus on natural resources. Moreover, individuals in the sociology of natural resources have incorporated new ideas and technologies as they become available such as geo-spatial

analyses that result from satellite and computer technology. Topics such as the social landscape, amenity development, and tools for spatial analysis have furthered sociological research into the interaction of the natural resource use and the social world.

ENVIRONMENTAL SOCIOLOGY

Beginning with the environmental crises in the 1930s and extending into the 1950s, a specific consideration of environmental issues began to enter into the consciousness of the American public and gain political traction with policy makers. Politically, the environment entered the policy arena in the mid-1960s as water and air pollution came to the Senate Committee on Environment and Public Works. The Public Works Committee was then chaired by Senator Edmund Muskie (D – Maine) and was formed in 1963, resulting in a variety of environmental mandates (e.g., the Water Quality Act, 1965; the Clean Water Restoration Act, 1966; and an air quality bill in 1967) and ultimately resulted in the creation of the governmental agencies designed to deal with environmental issues.

The decade of the 1960s was also the beginning of a time of social awareness about the environment and set the platform for Earth Day and federal intervention into the environment via the National Environmental Policy Act (1969) and the Environmental Protection Agency in 1970. This led to researchers investigating not only the environment, but human impacts on that environment. Two works in particular serve as examples of the increased attention, but also demonstrate the public thirst for information regarding the environment. *Silent Spring*, by Rachel Carson (1962) became popular among the general public and disclosed the lasting effects of

pesticides. Carson demonstrated that not only were human actions having a profound impact on wildlife, the people who were using the pesticides had control over the problem and, more importantly, had choices regarding their use of pesticides. Six years later, Garrett Hardin (1968) wrote the article “The Tragedy of the Commons” which initially tapped a more academic audience and had a lasting impression regarding land use, and perhaps more importantly for this work, had an effect on the ways people conceptualized public lands.

The 1960s were years of substantially enhanced public awareness for the environment. This cultural shift toward a broader conceptualization of stewardship was more firmly rooted in scientific inquiry than in ethical responsibilities. Certainly, this cultural shift was brought about in part because of the impact of *Silent Spring* (1962) and “The Tragedy of the Commons” (1968). The cultural shift also resulted from the combination of increasing levels of education, movement out of the cities into the suburbs, and greater affluence among people in the U. S. These two seminal works and the changes in education, affluence, and suburban growth were all factors that combined to increase interest in, and awareness of, environmental issues. As a result, environmental groups such as the Sierra Club (est. 1892), the Audubon Society (est. 1905), and the Wilderness Society (est. 1935) were joined by new organizations such as the Environmental Defense Fund (est. 1967) and the National Resource Defense Council (est. 1970). In addition to the bevy of political activity, the 1970s was an interesting era for sociologists as well.

Environmental sociology is clearly visible by the early 1970s. It is not coincidence that sociologists found environmental issues worthy of sociological

inquiry at the same time environmental awareness in the U.S., particularly the success of Earth Day, emerged as a viable political movement. Klausner (1971) expressly intended his book, *On Man in His Environment* to be a sociological consideration of the environment, rather than an environmentalist look at sociology (p. x) and enlisted the first chapter of the text to discuss the “current neglect of man-environment studies.” The second chapter of the text considered theoretical aspects of demography, human ecology, and location, thereby establishing the theoretical thrust of the text and separating it from the more resource-oriented applications in the rural sociological literature. The book continued to focus on thinking “social scientifically” about human impacts on the environment and ended with the consideration of specific problems, e.g., air pollution, noise pollution, and outdoor recreation.

One of the first uses of the term “environmental sociology” in the mainstream literature appeared in 1975. The *Cornell Journal of Social Relations* ran a “Special Issue on Environmental Sociology,” with an introduction by Kenneth E. Pigg. Pigg argued that the importance of a scholarly area may be measured by how familiar people are with “that area’s most common illustration” and suggested that an “area now becoming known as environmental sociology” (Pigg, 1975b, p. 1) was gaining in stature in part because of growing awareness of Hardin’s (1968) paper on the “The Tragedy of the Commons.” In this introduction, Pigg identified the original thrust of environmental concerns as urban air pollution and the potential for health problems associated with pollution, and argued that that scope had broadened to include destruction of habitat, oil slicks on waterways, misuse of pesticides and fertilizers, and radioactive waste (see Pigg, 1975a for a complete discussion).

The special issue of *Cornell Journal of Social Relations* resulted from discussions in a workshop held at Cornell University and funded by the Rockefeller Foundation between October 21–24, 1974. The thirty-eight participants in the workshop discussed the still forming environmental sociology and were, in particular, interested in assessing methodological approaches to tap environmental attitudes and behaviors. The growing importance of environmental sociology was articulated by Pigg in the summary remarks to the special issue, concluding that environmental sociology was “in the public eye like no other branch of social science has ever been” (Pigg, 1975a, p. 182). Because of the limited circulation of the *Cornell Journal*, however, this early work on environmental sociology remains relatively unknown.

Three years after the special issue of the *Cornell Journal*, “Environmental Sociology: A New Paradigm” by William R. Catton, Jr. and Riley E. Dunlap (1978) appeared in *The American Sociologist* and it is this article that many consider to have been the beginning of the literary discussion of environmental sociology. The following year Dunlap and Catton (1979) further articulated the burgeoning “Environmental Sociology” in *Annual Reviews of Sociology*. In this text, the authors traced the organizational development of environmental sociology and their timeline indicates a bureaucratic development of environmental sociology that predates the development of the perspective in the literature. Dunlap and Catton first mention the development of the Natural Resources Research Group within the Rural Sociological Society (1964) and note that this was followed by the creation of an “Environmental Problems Division” within the Society of the Study of Social Problems in 1972. The American Sociological Association (ASA) approved the creation of a new committee

to specifically inform issues regarding environmental impact statements, which resulted in as “Ad Hoc Committee on Environmental Sociology” (1974). The ASA “Section on Environmental Sociology” was organized in 1975 and officially recognized in 1976 (see Dunlap and Catton, 1979, 2002 for a complete discussion).

William Freudenburg and Robert Gramling (1989) proposed that the two sociologists who were the most influential in the “emergence, development, and institutionalization” of environmental sociology were William R. Catton and Riley E. Dunlap (p. 440). Indeed, their two seminal works in the area in 1978 and 1979 have more citations than any other environmental sociology work with a combined total of 187 citations (Web of Science, 2006). Framing their discussion around the rise of, and growing environmental awareness of the 1970s, Catton and Dunlap introduced the “New Environmental Paradigm” (NEP) as a way of including environmental issues in the study of sociology. Here, Catton and Dunlap credited Allan Schnaiberg (1972) with developing the question at the heart of environmental sociology, albeit in an unpublished manuscript, and concluded, “The study of interaction between the environment and society is the core of environmental sociology” (Catton and Dunlap, 1978, p. 44).

Some of the issues that enticed rural sociologists to study natural resources were among the concerns that initially drew sociologists into environmental studies, including resource management problems and water resource development. These studies also included sociologists who came into the environmental sociological question via studies in leisure behavior, applied sociology, and social movements (Dunlap and Catton, 1979, p. 246–247). Dunlap and Catton posited the analytic

framework for environmental sociology, differentiating it from the sociology of human ecology by noting the organizational focus of the latter. Hence, Dunlap and Catton identified “the fundamental characteristic of environmental sociology [as] the importance attached to the environment as a factor that may influence, and in turn be influenced by, human behavior” (Dunlap and Catton, 1979, p. 252). Specifically, the environment changed from being primarily considered as a social phenomenon to becoming a physical one. Within this new paradigm, Dunlap and Catton proposed areas that would provide interesting research avenues for environmental sociologists including; response to environmental problems, natural hazards and disasters, social impact assessments, energy scarcities, resource allocation, and carrying capacity.

Freudenburg and Gramling (1989) have proposed that the acceptance of environmental sociology has been “an uphill battle” among sociologists and suggest the reasons for resistance to an environmental sociology include a variety of factors that might be located in the cultural traditions of sociology. First, these authors suggest the historic abundance of resources allowed early sociological thought to develop in such a way that the physical environment was rarely considered as a part of the sociological research question. Second, sociologists in general exhibited a negative reaction to Social Darwinism. This resulted in an intentional separation from biologically-oriented explanations in sociology. Third, classical social theorists focused on social environments to the exclusion of the physical environment and even the micro-level theorists ignored the physical environment and focused on “socially derived definitions” that were arrived at separate from a consideration of the physical environment. These are legitimate points and are still applicable 25 years later, thus,

much of contemporary sociology is still focused on strictly social processes. It is also true, however, that environmental sociology appears to be firmly entrenched as a branch of accepted sociological thought.

THE SOCIOLOGY OF NATURAL RESOURCES AND ENVIRONMENTAL SOCIOLOGY

Researchers engaged in environmental sociology and the sociology of natural resources employ different theoretical assumptions and methods. These differences derive in part from the independent origins of the sociology of natural resources and environmental sociology, their different foci, and the conceptual orientation of environmental sociology toward macrosociological theory while the sociology of natural resources is a mid-range theory. In addition, each sub-discipline is conceptually distinct regarding what should be done with the research once it is completed. These conceptual and methodological differences between environmental sociology and the sociology of natural resources might lead some to believe that the two disciplines are not just separate, but necessarily separate.

A debate over just this contention took place in the pages of *Society and Natural Resources* (2002) that is pertinent for this discussion. Consider Table 1, adapted from Buttel (2002), in which the differences between Environmental Sociology and the Sociology of Natural Resources are outlined. At first glance it might appear that maintaining environmental sociology and the sociology of natural resources as separate fields of inquiry makes sense because of the inherent differences between the two. One might also envision, however, ways that these two perspectives could inform the same research question.

TABLE 1

**A COMPARISON BETWEEN ENVIRONMENTAL SOCIOLOGY
AND THE SOCIOLOGY OF NATURAL RESOURCES**

<i>Environmental Sociology</i>	<i>Sociology of Natural Resources</i>
Response to environmental movement	A product of agricultural studies
Highly theoretical	More applied
Study national, global problems	Study local, regional problems
Metropolitan focus	Rural focus
Structure	Agency
Actors <i>in</i> the environment	Actors <i>on</i> the environment
Focus on pollution, degradation	Focus on resource management
	(Buttel, 2002)

Jill Belsky (2002), Buttel (2002), Dunlap and Catton (2002), Field, Luloff, and Krannich (2002), and Thomas Rudel (2002) argued for maintaining the separation between environmental sociology and the sociology of natural resources for a variety of reasons, and the reasons cited are varied. For example, both Rudel and Belsky employ an international element in their research, and there are components within the sociology of natural resources that make it better suited for discussing the conditions in developing conditions (cf. Belsky, 2002; Rudel, 2002). Buttel (2002) and Field, *et al.* (2002) noted that fundamental differences exist between the two fields in part because of the differences in how both developed and in part because of the different constituencies that were served by both disciplines. These constituencies are still served by maintaining a separation and thus there are practical reasons for keeping the two disciplines separate. Dunlap and Catton (2002) were encouraged by the “continued vitality” of both environmental sociology and the sociology of natural resources, and also suggested that the disciplines catered to an important, and different, clientele. Dunlap and Catton, however, also noted the necessary overlap

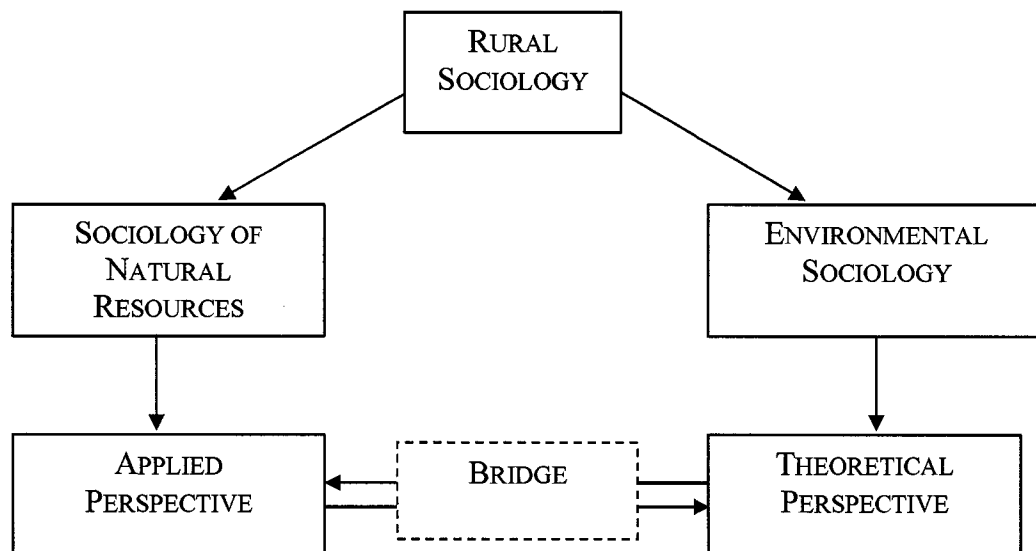
between environmental sociology and the sociology of natural resources. In fact, none of these researchers suggested that the two areas were not compatible and moreover, Buttel; Dunlap and Catton; and Field, *et al.* specifically called for work that combined aspects of both disciplines.

Researchers such as Freudenburg (2002) and Eugene Rosa and Gary Machlis (2002), however, argued for a blending of the two disciplines. Freudenburg noted that many questions of sociological interest necessarily engage both environmental sociology and the sociology of natural resources. Here, Freudenburg used an example of a research question involving harvesting timber (extraction of a resource) in an old growth forest (environmental sociology) to illustrate how both disciplines inform a single question of interest. Rosa and Machlis further contended that the separation was “artificial and counterproductive” and supported the blending of the two into a single entity. It was also suggested that the separation between rural sociology and the sociology of natural resources could be a detriment to both fields because of the relatively small number of researchers in both camps (cf. Buttel, 2002).

William Warren (2005) moved beyond discussing whether the two disciplines *should* be merged and combined both environmental sociology and the sociology of natural resources under the rubric “hierarchy theory,” a single theoretical perspective. Warren blended what he termed the “micro and macro” approaches of the sociology of natural resources and environmental sociology into “environmental and natural resource sociology.” Warren’s theory combined aspects of structuration theory (from sociology) with hierarchy theory (based in ecology) and formed a perspective that, according to Warren, would “facilitate the analysis of socioecological systems”

(Warren, 2005, p. 447). Warren concluded that this environmental and natural resource sociology would make his theory applicable to large-scale “institutional dynamics” while conceptualizing society as a part of “nature.”

This study works from the position that while environmental sociology and the sociology of natural resources are two traditionally separate perspectives, there are complementary aspects of each perspective that can be blended into a partially unified theory. Aspects of the two theories could be combined and the strengths of one would augment weaknesses in the other. Rather than providing one specific way to merge the two disciplines (cf. Warren, 2005), however, this article proposes that researchers could employ a theoretic and flexible “bridge” that would provide a combination of important concepts from each of the two distinct areas of study.



Utilizing a conceptual bridge would allow the two sub-disciplines to inform particular sociological questions while still providing for the two disciplines to maintain separate conceptual frameworks (cf. Buttel, 2002). This combination would

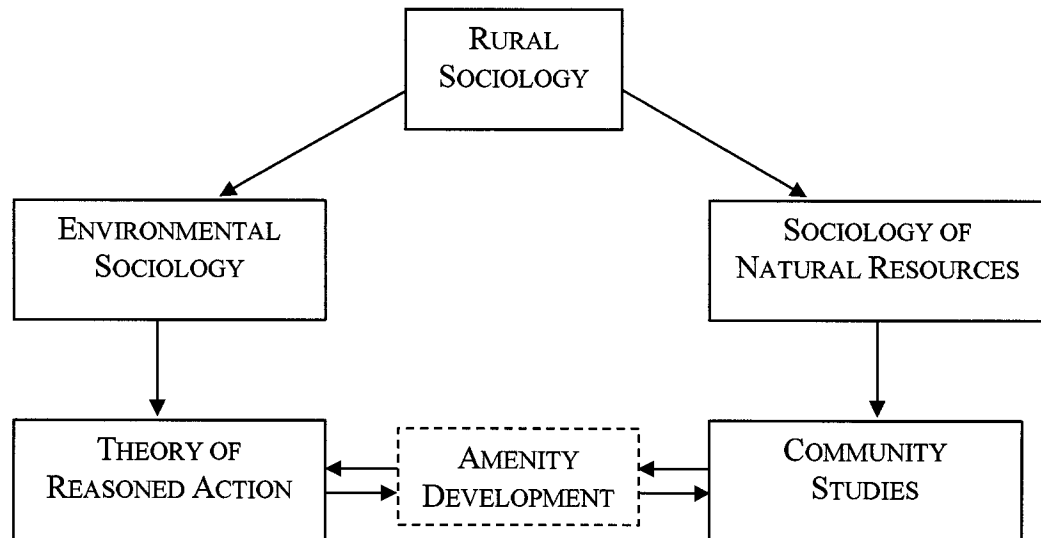
allow for the analysis of situation specific social and environmental inquiry, while providing an avenue for tapping the literatures of environmental sociology and the sociology of natural resources. As conceptualized here, the bridge between environmental sociology and the sociology of natural resources would permit pragmatic yet conceptually tight integration of the literatures specifically identified to fit a proposed study.

The concept that acts as a bridging mechanism could therefore be selected, based on the research question, and could be drawn from the researcher's knowledge base. Hence, rather than maintaining a rigid separation of theoretical perspectives, or attempting to synthesize environmental sociology and the sociology of natural resources into a single entity, the bridge would allow for the best of both. The bridge would provide an avenue for researchers who wanted to combine complementary aspects from both theories to develop additional tools to explain social phenomena, while still maintaining the sovereignty of each sub-discipline.

THIS RESEARCH PROJECT

According to Field *et al.* (2002, p. 218), a variety of theoretical approaches are important in the overall discussion of environmental sociology. In particular, Field *et al.* discuss the theory of reasoned behavior and the theory of reasoned action (Ajzen, 1991, 2001; Ajzen and Fishbein 1977; Fishbein, 1963, 1967a, 1967b) as one of the key theoretical perspectives in environmental sociology. These researchers also note that from within the sociology of natural resources, issues of the community have been of primary importance. For this research project, a blending of environmental sociology and in particular, theories of reasoned behavior, and the sociology of natural

resources, specifically community, will be bridged by considering amenity development.



Amenity development can serve as a “bridging” or unifying concept. The use of amenity development to bridge the two sub-disciplines and the literatures from each will allow for a dialog to ascertain whether newcomers and specifically, newcomers with relatively high socioeconomic status embrace the beliefs, behaviors and attitudes of their new community. Moreover, amenity development permits the theoretical aspect of environmental sociology to inform changes in the community.

In particular, the theory of reasoned action informed by aspects from exchange theory, and the literature on community studies jointly provide the basis for studying ranchers in Moffat and Routt counties in Colorado. The theory of reasoned action will provide a method of analyzing ranchers’ responses to questions regarding their attitudes towards issues including the environment, ranching, and their communities. Exchange theory provides a layer to the theory of reasoned action that will place the

ranchers' actions in a social context. The community literature will inform the ways that amenity growth has affected the ranchers' communities, or more specifically, respondents' perceptions of community.

THEORY OF REASONED ACTION

Although researchers in social psychology had been interested in behaviors and attitudes for many years, it was really the work of Martin Fishbein and Icek Ajzen that provided for the development of a cohesive theory of reasoned action (Ajzen, 1991, 2001; Ajzen and Fishbein 1977; Fishbein, 1963, 1967a, 1967b). The work with the greatest impact was the Ajzen and Fishbein (1977) article, although Fishbein had developed portions of the theory as a graduate student through his doctoral dissertation, and finally in articles that appeared prior to the work by Ajzen and Fishbein.

In a report of results from his dissertation, Fishbein (1961) provided the basic premises of his theory of "the relationships between beliefs about an object and the attitude toward that object" (Fishbein, 1963). Fishbein's theory contended that the primary determinant of behavior was the individual's intention to perform the behavior. Ajzen and Fishbein (1977) extended Fishbein's original work to include a fully articulated model for the consideration of beliefs, behaviors, and attitudes. Ajzen and Fishbein began by stating that one's attitude was "held with respect to some aspect of the individual's world" (Ajzen and Fishbein, 1977, p. 889). Behavior, on the other hand, was defined as some observable behavior that could be measured by observation or through self-reporting. By placing the attitude to perform a behavior into a social context, the authors insinuated social norms into the decision making

process, which by implication resulted in some level of pressure on the individual to perform the behavior.

Ajzen and Fishbein (1977) further posited that if a behavior was thought to have positive consequences, the individual performing the behavior would have a positive attitude towards the behavior while the converse was true for negative behaviors and consequences. In addition, both attitudes and behaviors could be viewed as consisting of four elements: the action, the target, the context, and the timing. Finally, the strength of the relationship between an attitude and a behavior was a function of the “degree of correspondence between attitudinal and behavioral entities” (Ajzen and Fishbein, 1977, p. 891).

Ajzen (1991) developed the theory of the mid-range he termed ‘planned behavior’ in order to provide an additional aspect to the original model. The theory of planned behavior allows the model to compensate for people’s perceptions of how much control they have over a given behavior (Ajzen, 2001). Thus, the theory of reasoned action is more appropriate for people who have complete discretion regarding their behavior while the theory of planned behavior is appropriate when an individual may not have full discretion in a given behavior (see Brown, 1999, p. 3). The two concepts are combined here under the rubric of the theory of reasoned action.

The theory of reasoned action allows researchers to assess relationships between beliefs, behaviors, and attitudes from within a given social context. This is important for the study at hand because the influx of new residents in the study area and more specifically, into Routt County, has potentially resulted in measurable differences between new residents and old residents in the study area.

EXCHANGE THEORY

George C. Homans (1958) stated that one of the “oldest theories of social behavior” involves the exchange of both material and non-material goods. Framed through the lens of rational-choice theory, exchange theorists posit that social life involves exchanges between actors as part of everyday life. Rational choice theory and in particular game theory provide a cost-benefit rational for behaviors, suggesting that people will weigh the costs of an action against any benefit from that action, and then act based on the perceived outcome. The primary difference between rational choice theory and exchange theory is that under exchange theory, the costs and benefits may be economic, but also involve a decision matrix that includes emotions, socialization, and ideas of community, among others.

The *Prisoner's Dilemma* (von Neumann and Morganstern, 1964) is a game theoretic approach to systems of cooperation and is intended to demonstrate the concept that individually rational actions are not rational at the group level. If individual acts occur in isolation, the rational action is to defect – or fail to provide a material or nonmaterial good that was promised. If, on the other hand, an actor is operating in a social context where he or she is likely to have repeated interactions with others, it becomes more rational to cooperate – provide the material or nonmaterial good that was promised. In general, the collectively rational decision is to cooperate but in the absence of information, people will make decisions based on what is individually rational (Axelrod, 1984; Luce and Raiffa, 1957; von Neumann and Morgenstern, 1964; Zagare, 1984). Exchange theory allows researchers to

reconceptualize game theory by considering the actors within their social context where interactions are repeated.

Exchange theory is a good supplement to the theory of reasoned action. Recall, the theory of reasoned action allows researchers to consider the relationship between beliefs, behaviors, and attitudes at an aggregate level. By also considering exchange theory, researchers are also able to consider individual or small group dynamics.

COMMUNITY STUDIES

Sociology researchers have studied a variety of community issues, from very general studies that provide descriptions of the conditions of “the community” (e.g., Hollingshead, 1938, 1948), to more specific considerations that include particular issues and community. For example researchers have considered the effect of economic development on feelings of community (Zekeri, 1999), the effects of boomtown tourism (Perdue, Long, and Kang, 1999), the transition of agriculture and its affect on farms and farm families (Lobao and Meyer, 2001), and migration and social networks (Brown, 2002). Additional works that describe community attachment have also been important aspects of discussions of community (see, for example, Brehm, Eisenhauer, and Krannich, 2004; Davenport and Anderson, 2005; Payton, Fulton, and Anderson, 2005; Steadman, 2003; Steadman, Beckley, Wallace, and Ambard, 2004; Swanson, 2001a, 2001b).

Community studies demonstrate the importance of the sociology of natural resources and its ability to provide an avenue for studying aspects that may be unique to one location without the attendant issue of trying to generalize from Community A to Community B. A specific consideration of Routt and Moffat counties will utilize

concepts drawn from the subdisciplinary literature on community studies focused on amenity development. In particular, this study provides an analysis of the ranchers and what impacts amenity growth is having on their communities.

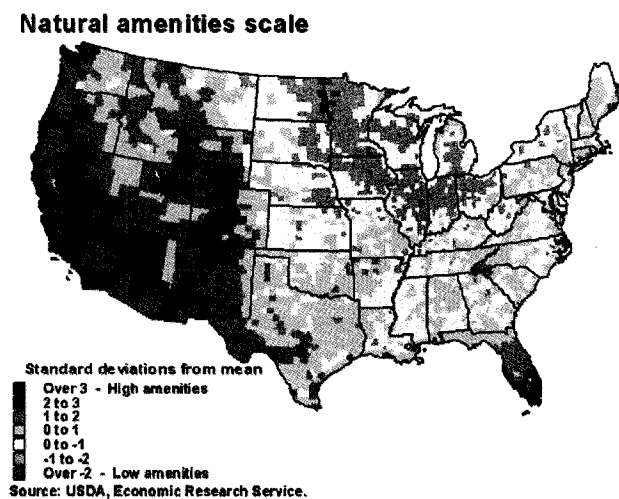
COMBINING THE THEORETICAL PERSPECTIVES

There is a conceptually important overlap between the work of early sociologists (e.g., Kolb, 1933) who considered how social relations were affected by geographical features and the contemporary interest in spatial configurations and social relations. Kolb's early work considered physical barriers to social relations, while modern day researchers consider how geography lends itself to population growth and in turn, affects sociality, a phenomenon commonly referred to as amenity growth or amenity development. The contemporary consideration of amenity development is the component that will bridge the theory of reasoned action and community studies and allow both an environmental and a sociology of natural resources perspective to inform this research.

Amenity development has resulted from a variety of contemporary social forces including greater affluence among a portion of the U. S. population and advances in technology, especially computer technology. It is proposed here that this period began in the 1980s. A consequence of this integration of affluence and technology, local people had both the means and opportunity to live in these high-demand areas beginning in the 1980s. The influx of new settlers into amenity growth areas is a settlement trend that has generated scholarly research and public debate (e.g., Brehm, Eisenhauer, and Krannich, 2004; Hunter, Boardman, and Saint Onge, 2005; Kim, Marcouiller, and Deller, 2005; Smith and Krannich, 2000; Steadman and

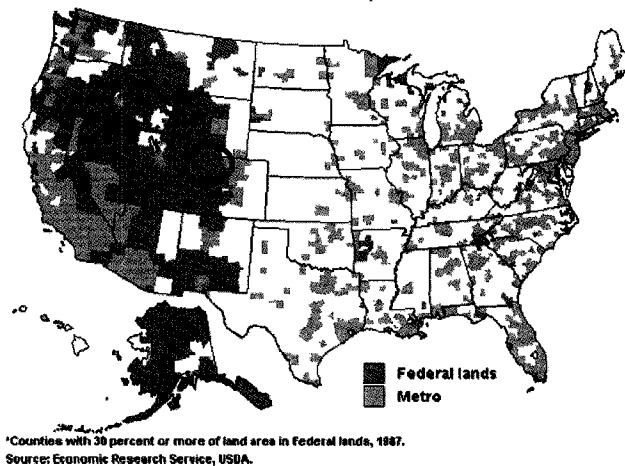
Hammer, 2006). Research that combines environmental and amenity factors with agriculture has also developed with the migration of individuals into the exurbs (Gibon, 2005; Jackson-Smith, Kreuter, and Krannich, 2005; Ready and Abdalla, 2005; Zollinger and Krannich, 2002).

As noted previously, areas that are high on the amenity scale have a striking association with public lands. For northwestern Colorado, the natural amenity score is between two and three standard deviations above the mean and the percentage of public lands is relatively high. Moffat County covers 4,743 square miles, 2,514 square miles of which is federal or public land. Therefore, just over 53 percent of the total land in Moffat County is managed by a federal agency such as the BLM or USFS (Comstock, 2006). Conversely, 44 percent, or 1,044 square miles of the total 2,362 square miles of Routt County is managed by either the BLM or the USFS (The Wilderness Society, 2000).



Source: Economic Research Service, 2004

Nonmetro Federal lands counties, 1987*



Source: Economic Research Service, 2004

The extensive public lands character for these two counties as well as for the intermountain west introduces a special social and economic dynamic. It brings a new set of actors into the discussion of community because the numbers of individuals who use public lands has grown for many of the same reasons that amenity development has increased. More people with more disposable income coupled with technology that allows people to access the out-of-doors with relative ease and comfort has resulted in an increase in the number of people using public lands for recreation.

In some cases, public land access is only available through private properties. Moreover, much of the increase in public land use in amenity areas is associated with the popularity of rafting, kayaking and similar recreational uses. The water is usually public space, but the land under the rivers is often privately owned or at the minimum, the rivers border private lands. The intersection of individuals who wish to engage in recreational activities and the ranchers has often resulted in contentious feelings between the ranchers and between the outdoor recreationalists. Therefore, the public land dimension also lends itself to peoples' overall sense of community.

The next chapter of this text will statistically assess the bridge theory utilizing a 2002 survey conducted at Colorado State University, *Ranching and Farming in Colorado; Understanding the Challenges Facing Landowners and Operators*.

Responses for questions regarding individuals' beliefs, behaviors, and attitudes, how people feel about new residents in their communities, and how respondents feel about the public land dynamic will be tested through survey analysis, as well as through comments that respondents provided on their surveys. For the ranching population, it is appropriate to assess a broad definition of "community," so for the purposes of this study, Routt and Moffat counties will serve as the two communities of interest.

The chapters that follow will provide a description of the methods that were used to gather and analyze data. In doing the data analysis, hypotheses informed by the theoretical perspective were tested. Broadly, the null hypotheses are;

- no differences in attitudes between respondents in Moffat and Routt counties regarding public land use,
- no differences in attitudes between "new" and "old" ranchers regarding public land use,
- no differences in attitudes between respondents in Moffat and Routt counties regarding attitudes about the environment,
- no differences in attitudes between "new" and "old" ranchers regarding attitudes about the environment,
- no differences in attitudes between respondents in Moffat and Routt counties regarding how respondents feel about their community,

and

- no differences in attitudes between "new" and "old" ranchers regarding how respondents feel about their community.

CHAPTER THREE

Thank you for your time in performing this survey. I look forward to reviewing the results. Respondent 604.

THE SURVEY

In 1999, Colorado State University (CSU) researchers in the Department of Rangeland and Ecosystem Management, a graduate student Helen Ivy Rowe and her advisor E. Tom Bartlett (2001), conducted face-to-face interviews with ranchers in Routt and Moffat counties, Colorado, regarding issues about owning and operating a ranch in the state. These two counties were initially selected because researchers were interested in exploring counties that were close in proximity, but where one county had a traditional economy and the other had a tourist-based economy. The ranchers selected for participation in this original study were randomly selected from a sampling frame of 242 Federal permittees: ranchers with permits that allow them to graze cattle on the federal lands in the two counties (Rowe and Bartlett, 2001). Rowe and Bartlett stratified the sample by ranch size and livestock category and from that, surveyed 35 ranchers, 13 in Routt County and 22 in Moffat County.

The original research by Rowe and Bartlett (2001) identified issues that concerned ranchers and further, were suggestive of factors that could effect their ranching operations. Based on that preliminary data, a second project was identified that would tap the attitudes of a greater proportion of the ranchers in the area through a

survey to be conducted jointly by researchers in the Sociology and Range Management Departments. Work on the survey, including identification of the population and development of the survey instrument began in January, 2002.

Concurrent with the initial research phase at CSU, researchers from Utah State University (USU), working jointly with researchers from Texas A&M University were surveying ranchers in Utah and Texas (Krannich, Jackson-Smith, and Kreuter, 2002). Contact with researchers from Utah and Texas resulted in Colorado researchers obtaining a survey instrument that addressed pertinent questions for the Colorado ranching population; moreover, a survey instrument that had been tested and was already in use. Ann Franklin, the County Extension Agent in Moffat County, and C. J. Mucklow, the County Extension Agent in Routt County assisted in the modification of the survey instrument. The extension agents provided feedback on the general order of questions and identified sections of the survey that were not applicable to ranching in Colorado. These changes resulted in substantive changes in the survey both including the order of the sections in the survey, and blocks of questions added with others removed for the Colorado ranchers. Thirty-three questions were replaced with an additional six questions added, resulting in the Colorado survey containing approximately 17 percent new material and 83 percent overlap in the two instruments. The final survey instrument was 20 pages in length and contained 6 sections for a total of 238 variables. The final page of the survey was a section for participants to include comments (See Appendix 1).

In addition to providing assistance with the content and layout of the survey, Franklin and Mucklow also provided a complete enumeration of ranchers who owned

or operated a ranch of at least 100 acres, located in part or in full, in Routt and Moffat Counties. The number of ranchers who fit the criteria, 694, was relatively small; therefore the decision was made to survey 100 percent of the population. Although use of an entire population limits analysis of the data under traditional statistical approaches, permutation tests are naturally suited for population data (see, Edgington, 1995; Hayes, 1996; Ludbrook and Dudley, 1998). Therefore, on April 1, 2002, the survey entitled *Ranching and farming in Colorado: Understanding the challenges facing landowners and operators* was distributed to the 694 ranchers who fit the criteria for participation in the survey.

In broad terms, the survey was designed to ascertain what “tip factors” were involved in ranchers’ considerations regarding whether they would continue ranching, and what entered into those decisions when deciding to leave the industry. The survey had sections that included questions about the respondent’s ranch (e.g., number of acres, type of operation, number of animals, etc); the rancher’s future plans and feelings about his or her community; ranchers’ rights and responsibilities regarding their land as well as federal lands; various economic and social factors and how each affects the viability of the ranching operation; and demographic information. In addition to providing feedback regarding the survey, Franklin and Mucklow both signed cover letters urging ranchers to participate in the survey that were included in the original mailing. The survey mailing was accompanied by an article in area newspapers, announcing the survey (e.g., Salazar, 2002). One-hundred-eighty-four surveys were returned prior to a reminder post card mailing.

Following the Dillman (1978, 2000) technique, a reminder card was mailed May 13th followed by a second mailing of the survey on June 17, 2002. Between the post card mailing and the second mailing of the survey, 36 surveys were returned. The number of returns increased from 221 to a total of 287 returned surveys after the second mailing.

A third mailing was planned to follow fairly quickly after the second mailing, however it was delayed after consulting with the extension agents. The agents argued that late summer-early fall is a very busy time for ranchers and thus, there would be a greater chance of increasing the response rate by waiting until October to send the final round of surveys. A letter, signed by the two principle investigators, E. Tom Bartlett and Louis E. Swanson, stressing the importance of participating in the survey preceded the final mailing; October 11 and 21, 2002, respectively. Without adjusting the results to account for people who received more than one survey or should not have been included in the mailing, the response rate was 55.9 percent; 388 responses from the 694 surveys mailed.

RESPONSE RATE

A final cut-off date for responses to the survey was set at January 1, 2003. Once the deadline for survey responses passed, the data set was entered into a spreadsheet and verified. In addition, steps were taken to ascertain whether any of the respondents had received a survey in error and therefore should not have been included in the population; specifically, checking for participants who did not meet the criteria or individuals who received more than one survey. Of those who returned surveys, 37 responded that they were not eligible to fill out the survey because they

did not own or manage a ranch of 100 acres or more which reduced the number of eligible members of the population. An additional 23 names were removed from the population because survey respondents indicated that they had received more than one survey. Reasons for this included the fact that there were two or more addresses for the same property, or because multiple family members were identified for response for a single property. After finally adjusting for respondents who returned blank questionnaires, provided only written comments, or completed only a small proportion of the survey instrument, there were 325 usable surveys from an adjusted total population of 634, for a usable response rate of 51.26 percent. Finally, 138 of the surveys (42.46 percent) provided written comments that vary from just a couple of words to full pages of text.

METHODS

The significance of the observed departure from proportionality is therefore exactly tested by observing that a discrepancy as great or greater than that observed, will arise... in exactly 3,095 trials out of 6,653,325, or approximately once in 2,150 trials. The test of significance is therefore direct, and exact for small samples. No process of estimation is involved (Sir Ronald A. Fisher, 1935a, p. 50).

In May, 1838, Volume 1, Issue 1 of the *Journal of the Statistical Society of London* was published by members of the Statistical Society of London. Fellows of the society concluded that statistical thought had become important enough to both members of the society and the public that the time had come to produce a “Journal devoted to the collection and comparison of facts” (“Introduction,” 1838, p. 1). Thus began broad recognition of the field of statistics and several wide-ranging categories of statistical thought.

Two types of statistical tests are possible: one that relies on a theoretical distribution of the data, i.e., an asymptotic test, and one that relies strictly on the observed data, i.e., an exact or permutation test. Early statisticians emphasized a preference for exact statistics but also recognized the intractable nature of the exact solution. As a result, statistics moved away from exact tests and developed an extensive array of statistical tests based on theoretical distributions. Thus, exact tests were designed only for small samples and in addition, offered as evidence of the veracity of asymptotic solutions to the same statistical questions.

As the field of statistics progressed, the search for exact statistical tests gave way to the development of more and better asymptotic tests. The tendency in asymptotic tests was to focus on interval/ratio level data, with some attention devoted to nominal data. A wide variety of statistical tests were developed that allowed researchers to compare nominal level data categories (e.g., chi-squared) and interval/ratio level data (e.g., Student's t and ANOVA) but few statistics were developed for ordinal data, or mixed data categories involving nominal and ordinal data, or ordinal and interval/ratio level data (Berry and Mielke, 1992a).

As a result, contemporary researchers have an arsenal of asymptotic statistical tests for analyzing data for distributions that exist in theory, but not always in practice. Computer technology, however, has finally made permutation tests possible and, therefore, the early reliance on theoretical distributions is being eclipsed as permutation solutions are developed for more research problems. Moreover, most of the asymptotic statistical tests for Likert-scaled items (strongly agree, agree, neutral, disagree, strongly disagree) have not preserved the ordered nature of the

measurements, but rather, have treated ordinal level data as nominal data. Because permutation tests are data dependent, they are uniquely suited for providing a range of statistical tests that are suitable for all levels of measurement. Hence, many researchers are beginning to realize the superiority of exact solutions in a wide variety of research settings; however, broad acceptance of permutation solutions will require a paradigm shift for many researchers.

This chapter explores the history of statistics and follows the development of exact permutation tests. The chapter then goes on to provide an explanation for why permutation tests are paradoxically old and new, and why these solutions are preferred over traditional asymptotic solutions in many research settings. Finally, a permutation approach, “resampling,” is defined and a new permutation statistic that was designed specifically for the survey data in this study is presented.

PERMUTATION TESTS

Traditional statistical approaches for the analyses of data exist for a wide variety of research situations. Broadly, statistical analyses can be divided into two categories: parametric and distribution-free tests. Parametric tests are applicable for interval- and ratio-level data and include statistical techniques such as Student’s t , analysis of variance (ANOVA or the F test), and regression. As the name implies, parametric tests depend on estimating the parameters of a theoretical population distribution and are relevant for data that meet a variety of assumptions, most notably, that the data are continuous, normally distributed, and homoscedastic.

Distribution-free tests, also referred to as nonparametric tests, are utilized when the data are not normally distributed; especially nominal and ordinal level data.

Examples of commonly-used distribution-free tests include the Wilcoxon-Mann-Whitney test, Spearman's rank correlation coefficient, and the Kolmogorov-Smirnoff test. The permutation test may be considered a relative newcomer among distribution-free statistical tests, and is a statistical method that has been receiving increased attention since the mid-1970s.

Permutation tests have a substantial advantage over classical normal-theory based tests. The normal distribution has a density function given by

$$f(x) = \frac{1}{\sqrt{2\sigma^2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}, \quad [3.1]$$

and is a two-parameter distribution, i.e., a mean (μ) and a variance (σ^2). Here, μ is the point about which the sum of the *squared* deviations is minimized, while σ^2 is the average *squared* deviation from the mean. Thus, when normality is assumed, distances between objects are necessarily squared, and extreme values can unduly influence results. This is inappropriate for nearly all research situations.

Permutation tests do not assume normality so utilizing squared distance is not mandated, the distance function is undetermined and researchers are free to choose a the one that is appropriate for the data and the research question (see Mielke and Berry, 2001, p. 19). Absolute deviations, i.e., Euclidean distance, typically make the most intuitive sense because researchers tend to work and measure in a Euclidean space. Additionally, using a Euclidean distance function provides results that are extremely robust. Because the form is not dictated by the test, however, permutation tests allow for the researcher to select a geometry that is suitable; thus, researchers

have the option of using a Euclidean distance, a squared distance, or any other distance that makes theoretical sense for the data.

R. A. Fisher first suggested a permutation test that was free of distributional assumptions and was based solely on the observed data in 1925, and expanded his ideas on its use in 1935. In 1936, Fisher proposed a hypothetical case to elucidate the permutation approach, but a more formal discussion was not provided until E. J. G. Pitman (1937a, 1937b, 1938) presented theoretical considerations of the permutation test in a series of three articles. This early work was followed by discussions of permutation procedures by Welch, (1937, 1938), Wald and Wolfowitz (1944), Hoeffding (1952), and Kempthorne (1955).

In spite of this early attention to permutation tests, growth in the field was relatively limited until the 1970s. Because permutation tests are computationally intensive, the calculation of permutation tests was too difficult to be practical until computers provided an avenue that allowed researchers to perform large numbers of calculations very quickly and this, in turn, resulted in an increase in the numbers and types of permutation tests available for the analysis of data (see, for example, Edgington, 1995; Good 2000, 2001; Lunneborg 2000; Manly 1997; Mielke and Berry, 2001).

Permutation tests have been called the gold standard against which asymptotic tests are now judged (Bakeman, Robinson, and Quera, 1996; Read and Cressie, 1988), and because permutation tests utilize information from all possible permutations, or arrangements, of the data, they possess several advantages over traditional statistical tests. One advantage of permutation tests is that they are data-dependent, meaning

that all of the information required for analysis is contained within the observed data. A second advantage is that permutation tests do not depend on the assumptions associated with traditional parametric tests such as normality and homogeneity of variance (Berry, Mielke, and Mielke, 2002). A third advantage of permutation tests is that they provide an exact probability value, rather than an approximate value based on a theoretical, underlying asymptotic distribution.

The fact that permutation tests result in an exact probability is extremely important. Reinhard Bergmann, John Ludbrook, and Will P. J. M. Spooren (2000) investigated the efficacy of a variety of statistical packages and calculated probability values for the Wilcoxon–Mann–Whitney (WMW) test. Utilizing a single data set, researchers computed the results for the WMW test using 11 PC-based statistical packages including well-known statistical software such as SPSS 8.0 (SPSS, Inc., Chicago, 1999), S-Plus 2000 (MathSoft Inc., Seattle, 2000), SAS 6.12 (SAS Institute Inc., Cary, NC, 1999), and StatXact 4.0 (Cytel Software Corporation, Cambridge, MA, 1989). The researchers found that reported probability values varied between significant and nonsignificant levels for a nominal alpha of 0.05 and concluded that the *only* accurate form of the WMW test was “one in which the exact permutation null distribution [was] compiled for the actual data” (Bergmann, Ludbrook, and Spooren, 2000, p. 72). The editor of *The American Statistician* further noted that “it [was] a cause of considerable concern when the results for a relatively simple test differ across packages” (Hilbe, 2000, p. 71).

Traditional asymptotic approaches are based on fitting a continuous mathematical function, i.e., a theoretical distribution such as t , F , or χ^2 to a

hypothesized discrete sampling distribution constructed from test statistics from repeated random samples, drawn with replacement, from a population with specified parameters. Permutation tests permute the observed data and construct a discrete permutation distribution of test statistic values. Thus, permutation approaches are not predicated on repeated random samples. This is important because for many research applications, random sampling is not practicable (e.g., biomedical experiments or when small, finite populations are of interest). Permutation tests are superior to asymptotic tests for nonrandom samples and in situations where the data derive from a population.

Specifically, permutation tests operate under the null hypothesis that a specified treatment or condition has no differential effect on the selected group or groups (Ludbrook and Dudley, 1998); there is no assumed population or population distribution. Additionally, Hayes (1996) suggested a strength of permutation tests stems from the fact that permutation tests are naturally suited to test for association between two variables and thus issues of sampling are moot. Edgington simply stated that randomization is always valid (1995, p. 6). In other words, asymptotic statistical tests are based on a distribution that would exist if all possible *random samples* from within a specified population were considered; permutation tests are based on all possible *randomizations* of the given sample or population.

Asymptotically, once the continuous distribution is identified, the probability value is calculated using integral calculus to quantify the area under the curve for the region specified by observed test statistic and the shape of the distribution. The calculation of an exact permutation probability value is based on the discrete

distribution and is straightforward. A test statistic value, T_o , also known as the “realized” value of the test statistic, is calculated for the observed data. Then a test statistic value, T , and probability value P is calculated for each possible permutation of the data. The exact probability value, P , of T_o , is, depending on the statistic, either the sum of the probabilities associated with test statistics, T , that are as, or more extreme, than the realized value, or the proportion of T values that are more extreme than T_o (Mielke and Berry, 2001).

Calculating an exact probability can be computationally intensive for even small sample sizes. Consider a sample of $n = 10$ with $10!$ possible arrangements of the data. This small example has $10! = 3,628,800$ possible arrangements to be examined and by simply increasing the sample to $n = 14$, there are $14!$ or 87,178,291,200 possible arrangements. Thus, even with the dramatic advances in computer technology, an exact test may be untenable. In situations where the number of arrangements of the data is prohibitive, resampling procedures are recommended (Manly, 1997; Good, 2000, 2001; Lunneborg, 2000). In fact, one could make a compelling argument that as the field of permutation statistics advances, resampling will come to overshadow exact tests because resampling is available regardless of sample size, resampling closely approximates exact values to several decimal places of accuracy, and the probability values require much less computer time to calculate.

Resampling provides a good approximation to exact tests by taking a sub-sample of all possible arrangements of the data and counting the proportion of arrangements that are as, or more extreme, than the observed value (Mielke and Berry, 2001). Recent literature demonstrates that resampling probability values closely

approximate exact probability values as a function of the number of resamplings and the magnitude of the probability value. For example, under the worst case scenario in which the probability value is located in the middle of the distribution, say, for example $P = 0.5$, 1,000,000 resamplings provides three places of accuracy. For probability values that are located in the tail of the distribution, for example, between $P = 0.001$ and 0.05 , four places of accuracy are possible (Berry, Johnston, and Mielke, 2005; Mielke and Berry, 2001, p. 22). More accuracy is available by increasing the number of resamplings. An increase in two orders of magnitude results in one additional place of accuracy, e.g., 1,000,000 (i.e., 10^6) resamplings provides three places of accuracy. Four places of accuracy requires 100,000,000 (i.e., 10^8) resamplings.

In spite of the advances in computers, however, permutation methods in general and resampling tests in particular may not be appropriate for all research settings. Some parametric tests are robust, especially for large sample sizes and, therefore, provide a good approximation to the permutation test when the sample sizes get particularly large. In addition, if the probability is very small, the number of resamplings may not be large enough to provide an estimate of the probability value other than zero.

A HISTORY OF PERMUTATION TESTS

The earliest discussions of exact tests began appearing in the literature in the 1920s. Jerzy Splawa–Neyman (1923/1990) foreshadowed the use of permutation tests in an early article, although there is no indication that any of those who worked to establish the field of permutation tests were aware of the work by Neyman, which was

not translated from its original Polish language text until 1990. In this article, Neyman detailed an empirical example considering the design of a field experiment that utilized a number of agricultural plots. This example employed random assignment, described through the use of a “ball and urn” problem, and the probabilities of obtaining various experimental outcomes (Splawa-Neyman, 1923).

Two other early examples contain more explicit references to permutation methods; the first in *Statistical Methods for Research Workers* by R. A. Fisher (1925) and the second an article by R. C. Geary that appeared in *Metron* (1927). Fisher (1925) calculated an exact probability using the binomial probability distribution (Section 24, example 19, pp. 106–110) and although the use of the binomial to obtain a probability value is not technically a permutation test in the sense of the modern application of the term, the result is an exact probability value. Two years later, Geary (1927) used an exact analysis to demonstrate the utility of asymptotic approaches for data analysis.

Like Geary (1927), Eden and Yates (1933) utilized a permutation approach to compare a theoretical to an actual distribution. Eden and Yates’ data set consisted of four treatment groups and four treatment blocks for a total of 24^8 possible arrangements of the data. Given the enormity of calculating all possible arrangements of these data, Eden and Yates provided an early application of resampling by considering a sample of $n = 1,000$ arrangements and generated a table listing the true probabilities — those generated by the random sample — and the theoretical counterparts to those P values. In December, 1934, Fisher presented a paper for the *Royal Statistical Society* that appeared in proceedings the following year, and

described the logic of the permutation test, again utilizing the binomial probability distribution. Fisher did not expressly discuss permutation tests, but instead used the binomial to arrive at an exact probability for a 2×2 contingency table. The point of the example, that for small samples, exact tests are possible thereby eliminating the need for estimation (Fisher, 1935b), is indicative of an early understanding of the superiority of exact probability values computed on a known discrete distribution over approximations based on theoretical, asymptotic distributions.

In *The Design of Experiments* (1935a, section 11, pp. 13–29), Fisher again intimated at the usefulness of a permutation approach for obtaining exact probabilities and it is this text that many researchers refer to as setting the idea of permutation tests into motion. Fisher’s description of “the lady tasting tea” is often used to describe the idea underlying logic of permutation tests. In this hypothetical experiment, Fisher described a woman who claimed to be able to tell the differences in tea with the milk added first and tea with the milk added second. He concocted an experiment whereby the woman sampled cups of tea and identified the point at which the milk had been added; before the tea, or after. Fisher then outlined the chances of her being correct by merely guessing, based on the number of trials, in this case cups of tea (Fisher, 1935a, pp.11–29; Salsburg, 2001, pp. 1–2).

Fisher provided a second hypothetical discussion of permutation tests in *Design of Experiments* (1935a, section 21), but in this case, Fisher carried the example through, calculating test statistics for all possible pairs of the data. For this example, Fisher considered 15 pairs of planters containing seeds in similar soil and locations, with heights to be measured when the plants reached a given age. Fisher calculated

the exact P value for the 2^{15} possible arrangements of the data, based on the null hypothesis (H_0) of no difference. The exact P value was calculated as the proportion of values whose differences were as, or more extreme, than the realized value (Edgington, 1995, section 1.13). Fisher additionally noted that the example served to demonstrate that an “independent check” existed for the “more expeditious methods” that were typically in use, such as Student’s t test (Fisher, 1935a, pp. 45–46).

Fisher’s 1936 article “‘The Coefficient of Racial Likeness’ and the Future of Craniometry” provided an alternative explanation of how permutation tests work. Without calling the technique a permutation approach, Fisher described a shuffling procedure for analyzing data. His description began with two groups, $n_1 = n_2 = 100$ and a measurement of interest on each member of the two groups. The measurements would be recorded on 200 cards, shuffled, and divided at random into two groups of 100 each, a division that could be repeated in an enormous, but finite and calculable, number of ways. A consideration of all possible arrangements of the pairs of cards would provide an answer to the question, “Could these samples have been drawn at random from the same population?” (Fisher, 1936, pp. 486).

Hotelling and Pabst (1936) used permutations for calculating exact probabilities for small samples of ranked data in their discussion of correlation. This article utilized the calculation of a probability that incorporated all permutations of the data, under the hypothesis that all permutations were equally likely. The probability for any particular value was calculated as a proportion based on the number of permutations that were equal to, or more extreme, than the value obtained for the observed data. It is notable that while earlier works contained the essence of

permutation tests, the article by Hotelling and Pabst (1936) included a much more explicit description of permutation procedures, including notation (e.g., $n!$) and specific examples for small data sets. Thus, this 1936 article may be the first example that explicitly details the method of calculating a permutation test using all possible arrangements of the data. While Hotelling and Pabst's consideration of permutations is among the earliest descriptions of the calculation of an exact test, it is also important to note that the test is applied to rank data and was not extended to non-ranked data.

The work by Hotelling and Pabst (1936) became important in the discussion of distribution-free procedures involving ranked data, but did not have any real impact in the furthering of permutation tests. Fisher, however, continued to be influential in the discussion of permutation methods. B. L. Welch (1937) described Fisher's (1935a) inference to an exact probability, referencing *The Design of Experiments*, and noted that although the calculations would be lengthy, the result would be a hypothesis test that was free of assumptions about the data. E. S. Pearson (1937) also referenced the Fisher text in his consideration of randomizations with the "lady tasting tea," but as with Fisher, neither Welch nor Pearson fully explained the technique. It was not until 1937 that a series of articles by E. J. G. Pitman (1937a, 1937b, 1938) explicitly discussed the permutation approach for statistical analysis; an analysis that extended the method to include data that was not amenable to ranking.

In "Significance tests which may be applied to samples from any population," Pitman first stated the object of the paper was to "devise valid tests of significance which involve no assumptions about the forms of the population sampled" (Pitman 1937a, p. 119), and second, noted the idea underlying permutation tests "seem[ed] to

be implicit in all of Fisher's writings" (Pitman 1937a., p. 119). Edgington, however, notes that in 1986, Pitman indicated dissatisfaction with the introduction to his paper, writing; "I [Pitman] was always dissatisfied with the sentence I wrote... I wanted to say I really was doing something new" (Pitman, quoted in Edgington, 1995, p. 18). Pitman (1937b, 1938) further developed the approach for analysis of variance in the second and third papers in the series.

The 1938 article, "On tests for homogeneity," by B. L. Welch noted both the seminal work by Pitman (1937a) and the earlier work by Geary (1927) in his consideration of a test for homogeneity. Here, Welch advocated calculating exact values on a limited population before moving into an examination of the moments of an infinite population. This work continued with an example of an exact calculation and further concluded that if the variances of different samples were too different, normal theory could badly underestimate significant differences that might exist. An exact test, however, being free from the assumptions usually associated with asymptotic statistical tests, has no such limitation.

M. D. McCarthy (1939) also argued that for the use of a permutation test as a first approximation, before considering the data via an asymptotic distribution, citing earlier works by Fisher (1935a, 1936) as well as that by Welch (1938). M. G. Kendall (1938) incorporated exact probabilities utilizing the "entire universe" of permutations in his construction of τ , a rank correlation measure. Finally, Kendall, Kendall, and Smith (1939) employed permutations in their discussion of Spearman's rank correlation coefficient. These later works foreshadowed the center of much of the work on permutations during the 1940s; a focus on creating tables for small samples

that employed permutations for the calculations of exact probabilities. These tables were utilized for data analysis employing small samples and were combined with probabilities from theoretical distributions as sample sizes became too unwieldy to calculate exactly (Friedman, 1937; Kendall, 1938; Kruskal and Wallis, 1952; Mann, 1945; Wilcoxon, 1945).

In spite of these seminal works, permutation tests were not implemented in practice because permutation procedures, although simple to understand, were too computationally intensive to execute in all but the simplest of cases. Rather than pursuing permutation procedures to calculate exact test statistics and their associated probabilities on empirical sampling distributions, methodologists focused on refining asymptotic tests that could only approximate the true probability utilizing hypothetical sampling distributions.

Between 1940 and 1960, important strides were made in permutation tests including at least 50 articles on exact statistics (e.g., Cornfield, 1944; Hoeffding, 1952; Kempthorne, 1952, 1955; Mann, 1945; Scheffé, 1959/1999; and Wald and Wolfowitz, 1943, 1944). The primary advances, however, came indirectly through computer technology, which was an essential element in furthering exact permutation procedures. The advent of the high speed computer was integral to the advancement of the field of permutation tests, specifically because of enhancements in memory and processor speed. Hence while early generations of computers provided for an increased discussion of permutation tests, it was not until processor speed and storage approached modern dimensions that permutation tests became practical.

COMPUTERS

Charles Babbage is often recognized as the father of the modern computer. A gifted mathematician, Babbage developed the “difference engine” in 1821 to compile mathematical tables, and followed that with an idea for a more complex machine that could perform any type of mathematical calculation (Charles Babbage Institute, 2004). Because of funding problems within the British government, the Analytic Engine was never built. Babbage did, however, report his plans for the computing machine at a meeting in Turin, Italy, and that report became the foundation of an article by Menabrea who published a paper extending Babbage’s work in 1842.

Babbage was interested in the document but was unable to read the French text, so he enlisted the aid of Ada Byron (Lady Lovelace, daughter of Lord Byron) to translate the article. Byron, who was introduced to the idea of the “calculating machine” at a dinner party, had been captivated by Babbage’s description of his machine and in particular, the ways such a machine could benefit humankind. A mathematician herself, Byron and Babbage exchanged letters discussing the possibilities of a calculating machine, including her suggestions that such a machine might be applied to music composition, used for graphics, and be appropriate for both scientific and practical purposes. Through these correspondences, Byron offered a plan that would allow the engine to calculate Bernoulli numbers, a plan that is now considered to be the first “computer program” (Toole, 2000). Computers as we understand them, however, did not really come about until the mid-1940s.

Computer developments are broadly categorized by generations defined by the hardware technology employed in the computers in use at the time. The first

generation began in the mid-1940s and the technology that defines this generation is the vacuum tube. First generation computers were typically capable of 40,000 operations per second (Stallings, 2006). The ENIAC (Electronic Numerical Integrator and Computer) is generally recognized as the first computer and became operational in 1946. Interestingly, ENIAC was a decimal rather than a binary machine. von Neumann (1945), who worked on the ENIAC project, initiated the idea of the “stored-program” for the Electronic Discrete Variable Computer (EDVAC), which resulted in the “IAS first general purpose computer” developed at the Princeton Institute for Advanced Studies. The IAS is generally considered the prototype of all modern computers (Stallings, 2006).

Further advances made during this first generation of computer technology included developing the cathode-ray tube storing device, patented in 1946, which became the first form of random-access memory. In 1948 magnetic drum memory was developed, a device that was two inches long by two inches wide and held 10 binary digits (i.e., 0s and 1s) or “bits” of information per inch. In 1949 the Harvard-MARK III computer, the first of the MARK machines to use an internally stored program, became available (Carson, Burgess, and Miller, n.d.; Computer History, 2005).

Towards the end of the first generation, computer technology grew to include magnetic core memory. Core memory, developed at MIT in 1951 by Jay Forrester, consisted of ferrite toroids (cores), with one core required for each bit of memory, and rings, a method of storing information that was fast, but also expensive and “destructive”; that is, every read would force the ring into a zero state (Answers, 2005;

Core Memory, 2005; Wikipedia, 2005). During that same period, eleven articles involving exact procedures were published, although these articles primarily focused on the development of tables for small sample sizes (Onghena, 2002).

The second generation of computers was ushered in in the late 1950s and was defined when transistors replaced vacuum tubes in the computers. The use of transistors was a vast improvement because the transistor was smaller, cheaper, and produced less heat than its predecessor. At this point, computers had a typical speed of 200,000 floating operations per second (flops), a four-fold increase in speed from the first generation. The second generation was also witness to more complex hardware, the advent of high-level programming languages, and associated system software (Stallings, 2006). The technology, however, faced a problem. Early computers in this generation contained 10,000 transistors but this number grew into the hundreds of thousands as machines became more complex. The breakthrough that defined generation three was the 1958 – 1959 development of the integrated circuit — the compiling of multiple transistors on a single, silicon wafer. This development not only allowed for computers to move into the next generation, it had a direct effect on cost.

Jack Kilby and Robert Noyce are typically credited with developing the first integrated circuits. Both Kilby, who worked for Texas Instruments, and Noyce, co-founder of Fairchild Semiconductor Corporation, individually patented integrated circuits in 1959, but it was Kilby who went on to be awarded the Nobel Prize in Physics in 2000 for his integrated circuit, which predated that of Noyce by about six months (Nobelprize, 2005). Although both Kilby and Noyce continued to have

distinguished careers in the computer field, Kilby invented the portable calculator and Noyce was a co-founder of Intel, it is the integrated circuit for which both are best known. And as important as the integrated circuit was for advancing computer technology, it perhaps had an equally important effect on the cost of computers. As Kilby noted, “What we didn't realize then was that the integrated circuit would reduce the cost of electronic functions by a factor of a million to one, nothing had ever done that for anything before” (Kilby quoted in Bellis, 2005).

The third generation of computers began in the mid-1960s and was characterized by small and medium scale integration made possible by the integrated circuit. Integrated circuits consist of chips that contain memory cells. Early integrated circuits were capable of handling a limited number of memory components on the same chip and as the technology grew, more memory chips could be included in a single chip. Gordon Moore, also a co-founder of Intel, proposed Moore’s Law in 1965; the number of transistors that could be put on a chip would double every year and that that pace would continue into the future (Moore, 1975; Competitive Intelligence, 2005). Moore’s prediction proved correct for the next decade, and even when the pace slowed, the doubling time was still a remarkable 18 months, a pace that was still being met in 2005. The consequences of this doubling time translated into dramatically lower costs for memory, increased operating speed and reliability, and smaller computers with reduced power and cooling requirements (Stallings, 2006). The typical speed for a computer during this generation was 1,000,000 flops, again a four-fold increase from generation two to generation three. As for articles on

permutation approaches, Onghena (2002) identified 39 and 46 articles in the decades of the 1950s and 1960s, respectively.

Beyond the third generation, distinctions between generations become blurred. Broadly defined, the fourth generation encompassed the first half of the 1970s and was marked by the use of Large Scale Integration with a typical speed of 10,000,000 flops. The fifth generation was marked by Very Large Scale Integration with speeds of around 100,000,000 flops, and lasted from the mid-1970s into the early 1990s. The sixth generation was denoted by the use of Ultra Large Scale Integration with 1,000,000,000 flops (Stallings, 2006).

As memory and speed increased, the size of computers decreased. That meant that the technology that originally required large air-conditioned rooms and multiple technicians to run became available to individuals in private laboratories and offices. Part of this development came about as IBM developed a first in computers: A family that was designed to be upgradeable either as customer need required, or as the customer budget allowed. The second advancement towards widely available computer technology came about with Digital Equipment Corporation introduction of the minicomputer (Stallings, 2006).

The technology of processor speed also progressed as computer memory became more affordable and computers got smaller. “Clock speed” is the number of pulses a central processing unit can process per second and was measured first in kilohertz (kHz) and later in megahertz (MHz). A “bus” is a channel over which information flows and is measured in bits. The first “microprocessor,” the combining of multiple elements to increase overall processor speed, was developed in 1970 and

thus the decade of the 1970s saw clock speeds move from 108 kHz to a maximum of 10 MHz, and bus widths that went from four to 16 bits. The 1980s witnessed clock speeds up to 50 MHz and bus widths of 32 bits. The 1990s saw the first 64 bit bus width and clock speeds of up to 300 MHz. In the first decade of the new millennium, clock speeds are measured in gigahertz (GHz) with 1 GHz machines common place and prototypes for faster machines already operational (Brain, 2005; Clock Speeds, 2005; Kozierok, 2001; Stallings, 2006).

The number of flops has increased to speeds that are incomprehensible. Sandia National Laboratories announced it had a computer that had successfully completed 1.28 “teraflops”; a teraflop is one billion floating operations per second – and the lab expected to go higher than that in the near future (Miller, 1997). That number was surpassed in short order, and in 2005, IBM unveiled a computer at Lawrence Livermore National Laboratory that successfully completed 92 teraflops (Port, 2005). *Science News* (2005) reported a prototype transistor laser that has the capacity to switch on and off with a frequency of 3 gigahertz, and scientists working on the project indicated that frequencies 100 times as rapid appeared feasible. Moreover, industry leaders indicate that the next generation of computers will move away from silicon transistors and will focus on “nanoelectronics.” As the 2000s get underway, transistors are literally a “handful of molecules across” in size and although industry believes it can continue to shrink conventional transistors for another decade, the move towards nanoelectronics will likely result in components as small as individual molecules (ITRS, 2005).

As computer technology moved forward, researchers turned back to the idea of permutation tests for the analysis of data. Onghena (2002) indicated there were 184 scholarly articles specifically dealing with permutation approaches to exact probability values in the 1970s. In the 1980s, that number jumped to 295. Permutation approaches were gaining a following and as a result some of the most important new strides in permutation tests came about in the 1980s.

As the fifth generation of computers was in its early phase, researchers began exploring ways to calculate exact probability values while minimizing run times and memory usage. Mielke and Berry began working on exact permutation tests in the early 1970s and were exploring ways to generate all possible permutations of data as efficiently as possible. Berry (2006a) was convinced that it would be possible to write efficient code that would move permutation tests from the theoretical to the practical and in 1981 found the key to writing an efficient algorithm – Gray codes. Berry's work resulted in "Algorithm AS 179," a FORTRAN program that enumerated all possible permutations of the data with unprecedented speed (Berry, 1982).

The result was a program that allowed researchers to calculate exact probability values by employing all possible permutations of a data set. As an example, in April 2006, Algorithm AS 179, run on a UNIX platform and using a standard desktop computer, calculated 155,117,520 permutations in 94.3 seconds (CPU time), or in other words, is capable of doing 1,644,936.58 permutations per second (Berry, 2006a). Berry and Mielke have since utilized "Algorithm AS 179" in a number of different applications, with copies of the programs available to interested

parties as freeware through their book *Permutation Methods: A Distance Function Approach* (2001) and a public website, www.stat.colostate.edu/permute.

Mehta and Patel (1983) published a network algorithm that utilized a network of nodes and arcs for finding all paths through a network of a specified size. The result was probability values, that while not exact in the pure sense of the word, provided exact probability values that were accurate to several decimal places. Mehta and Patel went on to found Cytel (1987) and StatXact (1989) to provide commercial applications of their network algorithm.

Work on permutation tests has increased the field exponentially in the past two decades. Along with faster computers and better memory capacity, researchers have continued to work to make permutation tests faster through numerical analysis and more available through publications. As an example, Berry, Johnston, and Mielke (2004) provided a numerical analysis solution that utilized partitions and multinomial weights for a special class of problems that resulted in significantly reducing (i.e., millions of times) the number of required calculations for an exact probability.

The increase in computer speed has resulted in another benefit for permutation tests. All of the work on exact tests has established the efficacy of resampling statistics. Therefore, while exact tests are suitable for small sample sizes, resampling statistics are appropriate for any sample size and encompass a wide array of statistics available for testing a variety of hypotheses. As noted previously, the level of accuracy is simply a function of the number of resamplings.

PERMUTATION TESTS

As the field of permutation tests has developed, a variety of permutation tests, many with analogs among the asymptotic tests, have been created. From within the more traditional tests, permutation approaches are available for Student's t test, analysis of variance (ANOVA), regression, Least Absolute Deviation (LAD) regression, canonical correlation, chi-squared, likelihood-ratio tests, measures of agreement (such as Kendall's [1948] τ_a and τ_b , Stuart's [1953] τ_c , Somer's [1962] d_{yx} and d_{xy} and Goodman and Kruskal's [1954] γ), and measures of effect size.

The growth of permutation methods for analyzing data has resulted in increased acceptance from the academic community. A number of academic journals including *Annals of Statistics*, *Psychological Reports*, *Educational and Psychological Measurement*, *Journal of the American Statistical Association*, *Lecture notes in Computer Science*, *Human Brain Mapping*, *Journal of Statistical Planning and Inference*, *Advances in Applied Mathematics*, *Perceptual and Motor Skills*, *Journal of Nonparametric Statistics*, *Environment and Planning*, *Statistical Science*, and *the American Statistician* have all published articles utilizing permutation approaches.

In addition, a variety of books are now available on the subject: *Randomization Tests* 3rd Edition (Edgington, 1995), *Randomization, Bootstrap, and Monte Carlo Methods in Biology*, 2nd Edition (Manly, 1997), *Resampling Methods: A Practical Guide to Data Analysis*, 2nd Edition (Good, 2000), *Permutation Methods: A Practical Guide to Resampling Methods for Hypothesis Testing*, 2nd Edition (Good, 2000), *Analysis by Resampling: Concepts and Applications* (Lunneborg, 2000), and *Permutation Methods: A Distance Function Approach* (Mielke and Berry, 2001). And in addition to the freeware and software noted earlier, a variety of statistical packages

now have permutation tests available. “Resampling Stats” comes either as a standalone package, or as a complement to Microsoft Excel or Matlab. In addition, StatXact, S-Plus, SAS and SPSS all have options for exact and/or resampling tests. Thus, the technique that was once so elusive is now available for researchers for a variety of research settings.

Sociology, however, has been peculiarly silent regarding permutation approaches for analyzing data. The reason for this is in part steeped in tradition and in part a function of the large sample sizes typically found in sociology. Some researchers note that large samples mitigate the problems of meeting the assumptions of asymptotic tests. The answer to this is three-fold. Even with large sample sizes, exploration into subgroups within a given sample may result in either small samples or data tables with small expected frequencies, both of which are problems for traditional statistical tests. Second, large sample sizes *may* result in meeting the assumption of normality, although normality is a perennial problem for traditional statistical analyses (see, for example, Micceri, 1989), and even if assumptions of normality are satisfied, problems with heteroscedasticity persist regardless of sample size. Thus, even a robust asymptotic test may produce results that are questionable, which leads to the third point. The probability value obtained through a permutation test is an exact, rather than an approximate value, and even if the permutation test used is resampling, the result is exact to sufficient decimal places to make it superior.

From their inception, permutation tests were understood to be superior to asymptotic tests. Recall, permutation tests are data dependent, do not depend on the assumptions associated with asymptotic tests, are appropriate for use with a population

or a nonrandom sample, and provide an exact probability value. Moreover, permutation tests are appropriate for a wide-range of forms, including Euclidean distance and squared distances. Although superior, the tests were also impractical for all but the simplest of cases. Hence, permutation tests were the preferred theoretical method for data analysis, but in practice were used only to verify asymptotic tests. Later, special classes of permutation tests, rank tests, were developed because of the ease in calculating permutations on ranked data. Following the development of rank tests, permutation tests for interval-ratio data began to appear, but were still limited to applications with sparse data sets. It was the advent of high speed computing that allowed permutation tests to become practical. Permutation tests have since supplanted asymptotic tests for a variety of research designs, and the field continues to expand as researchers design new applications for permutation tests.

RESAMPLING AND TWO INDEPENDENT SAMPLES

Index of Ordinal Variation and Consensus

Few statistical procedures exist to analyze ordinal categories. In 1992, Berry and Mielke introduced an index of ordinal variation (*IOV*) that provided researchers a tool to assess respondents' answers to Likert scale questions that preserved the order and provided an opportunity to appraise statistical differences in variation or consensus (Berry and Mielke, 1992a, 1992b, 1992c). Those original works were extended in 2005 when Berry, Johnston, and Mielke provided a resampling procedure for the one-sample index of ordinal variation (Berry, Johnston, and Mielke, 2005). Johnston, Berry, and Mielke (2006) further extended the application of the one-sample

IOV to provide a tool for analyzing the differences between two independent samples. Because of the large number of calculations required for an exact test, Johnston, Berry, and Mielke focused on a resampling permutation procedure for analyzing either the consensus or difference between two independent samples.

The formulae are introduced for the one-sample case and extended to the two-sample case. Specifically, for c predefined, fixed, mutually exclusive categories, ordered from 1 to c with frequencies $n_1, \dots, n_c$ where

$$N = \sum_{i=1}^c n_i, \quad [3.2]$$

the index of ordinal variation is defined as

$$IOV = \frac{V}{V_{\max}} \quad [3.3]$$

where

$$V = \sum_{i < j} n_i n_j (j - i) \quad [3.4]$$

the summation is over all possible pairs of i and j such that $1 \leq i < j \leq c$, and

$$V_{\max} = (c-1) \left(\frac{N}{2} \right)^2 \quad [3.5]$$

if N is even, or

$$V_{\max} = (c-1) \left(\frac{N+1}{2} \right) \left(\frac{N-1}{2} \right) \quad [3.6]$$

if N is odd (Berry and Mielke, 1992b, 1992d; Berry, Johnston, and Mielke, 2005).

The complement, the index of ordinal consensus, is given by $IOC = 1 - IOV$.

Now consider two independent groups of objects with N_1 objects in Group 1 and N_2 objects in Group 2. The observed, test statistic for the difference between two independent indices of ordinal variation is given by

$$T_{IOV} = IOV_1 - IOV_2 \quad [3.7]$$

where IOV_1 and IOV_2 are the indices of ordinal variation for Group 1 and Group 2, respectively, and the observed test statistic for the difference between two independent indices or ordinal consensus is given by

$$T_{IOC} = IOC_1 - IOC_2 . \quad [3.8]$$

where IOC_1 and IOC_2 are the indices of ordinal consensus for Group 1 and Group 2, respectively.

In the context of N_1 objects from Group 1 and N_2 objects from Group 2 classified independently into c mutually exclusive ordered categories, there are $c^{N_1+N_2}$ equally-likely arrangements of the N_1 and N_2 observations. When $c^{N_1+N_2}$ is very large, an exact test is impractical and resampling is the recommended permutation method (Good, 2000, 2001; Lunneborg, 2000; Manly, 1997; Mielke and Berry, 2001). Resampling generates L random arrangements of differences between IOV_1 and IOV_2 , selected with replacement from the $c^{N_1+N_2}$ equally-likely possible differences. Consider the first of L resamplings. A two-step process (1) randomly assigns the N_1 objects from Group 1 to the c ordered categories and (2) computes the

index of ordinal variation, IOV_1 . The two-step process is repeated for the N_2 objects in Group 2 yielding IOV_2 . Finally, the difference,

$$T_d = IOV_1 - IOV_2, \quad [3.9]$$

is obtained.

Specifically, counters for each of the c ordered categories, indexed by $i = 1, \dots, c$, are set to zero and an independent uniform random variable U_j over $[0,1)$ is generated for $j = 1, \dots, N_1$ where N_1 is the number of objects in Group 1. If U_j belongs to

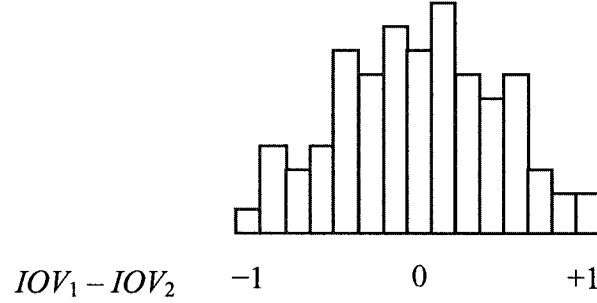
$$\left[\frac{i-1}{c}, \frac{i}{c} \right),$$

the i^{th} of c counters is increased by 1. When $j = N_1$, an index of ordinal variation, IOV_1 is calculated. The process is repeated for the c categories with Group 2, where $j = 1, \dots, N_2$ and an index of ordinal variation, IOV_2 is calculated. Next two counters, C_u and C_l for the upper- and lower-tail, respectively, are initialized to zero and the difference,

$$T_d = IOV_1 - IOV_2,$$

is computed and compared against the observed T_{IOV} difference between IOV_1 and IOV_2 . If $T_d \geq T_{IOV}$, the upper-tail counter C_u is increased by 1; if $T_d \leq T_{IOV}$, the lower-tail counter C_l is increased by 1. The resampling process is repeated L times, where L is some large number, e.g., 1,000,000, and the one-sided upper-and lower-tail probability values, P_u and P_L are given by C_u/L and C_l/L , respectively.

Conceptually, one might consider the sampling distribution of differences for either $IOV_1 - IOV_2$ or $IOC_1 - IOC_2$ with values ranging between ± 1 . Values on the extreme ends indicate no agreement between the two independent samples, and 0 indicates perfect agreement.



Consider the index of ordinal variation between two samples, $IOV_1 - IOV_2$ with survey responses for two independent groups in seven ordered categories from strongly disagree to strongly agree. An index of ordinal variation is calculated for respondents in the two independent samples. The realized statistic, T_{IOV} , represents the magnitude of the difference in ordered variation between the two groups. Under resampling, a specified number of resamplings is generated. The probability is the proportion of resamplings that result in values as great, or greater than, the realized value. The equivalent holds for the index of ordinal consensus.

As an example, consider $N_M = 142$ respondents in Moffat County and $N_R = 144$ respondents in Routt County. The two groups responded to the question “In the next five years, how likely are you to transfer management of your ranch to someone else?” taken from the *Ranching and Farming in Colorado* survey. Hypothetically,

respondents in both counties could have all responded that such an event is very unlikely:

	Very Unlikely			Uncertain			Very Likely
Moffat	142	0	0	0	0	0	0
Routt	144	0	0	0	0	0	0

Utilizing Equation [3.4] for these data, $V = \sum_{i < j} n_i n_j (j - i) = (142)(0)(1) + (142)(0)(2) + (142)(0)(3) + (142)(0)(4) + (142)(0)(5) + (142)(0)(6) + \dots + (0)(0)(1) = 0$.

From Equation [3.5],

$$V_{\max} = (c - 1) \left(\frac{N}{2} \right)^2 = (7 - 1) \left(\frac{142}{2} \right)^2 = 30,246$$

and Equation [3.3] yields

$$IOV = \frac{V}{V_{\max}} = \frac{0}{30,246} = 0.00$$

Repeating the calculations for Routt County results in a value of $V = 0$ and

$$V_{\max} = (c - 1) \left(\frac{N}{2} \right)^2 = (7 - 1) \left(\frac{144}{2} \right)^2 = 31,104$$

and

$$IOV = \frac{V}{V_{\max}} = \frac{0}{31,104} = 0.00$$

$IOC = 1 - IOV = 1 - 0 = 1$ for both counties, thus, $IOC_1 = 1$, $IOC_2 = 1$, and the difference, $IOC_1 - IOC_2 = 0$. Thus, there is perfect consensus within each county and perfect agreement between the two counties. Note there could be no difference in consensus among respondents in the two independent groups, but a difference in where the consensus exists which is undetected by the statistic.

	Very Unlikely		Uncertain			Very Likely	
Moffat	142	0	0	0	0	0	0
Routt	0	0	0	144	0	0	0

Alternatively, respondents could be evenly split between the two extremes in each county:

	Very Unlikely		Uncertain			Very Likely	
Moffat	71	0	0	0	0	0	71
Routt	72	0	0	0	0	0	72

For this configuration of the data, Equation [3.3] results in 30,246 for Moffat County and 31,104 for Routt County, and Equation [3.4] equals 30,246 and 31,104 for Moffat and Routt counties, respectively. The realized statistic given in Equation [3.2] is equal to 1 for respondents in Moffat and Routt Counties, respectively. $IOC = 1 - IOV$

= 0 for both counties, thus $IOC_1 = IOC_2 = 0$ and $IOC_1 - IOC_2 = 0 - 0 = 0$. That is, there is no consensus within either county but there is perfect agreement between the two counties.

A third scenario involves respondents in one county demonstrating complete agreement, while respondents in the second county show complete disagreement.

	Very Unlikely			Uncertain			Very Likely
Moffat	142	0	0	0	0	0	0
Routt	72	0	0	0	0	0	72

For this configuration of the data, Equation [3.4] equals 0 for Moffat County and 31,104 for Routt County, and Equation [3.5] equals 30,246 and 31,104 for the two counties, respectively. The test statistic given in Equation [3.3] is 0 for respondents in Moffat County and 1 for respondents in Routt County. $IOC = 1 - IOV = 1$ for Moffat County and $IOC = 1 - IOV = 0$ for Routt County, thus $IOC_1 = 1$, $IOC_2 = 0$, and $IOC_1 - IOC_2 = +1$. Note here that the sign of the difference is an artifact of the order of subtraction and therefore the magnitude of the difference is more meaningful than the sign of the difference. A value of $|1|$ is representative of complete disagreement between the two counties.

Consider the following question from the survey. The actual responses for the question, "In the next five years, how likely are you to transfer management of your

ranch to someone else?” result in the following distribution of responses among the ordered categories:

	Very Unlikely		Uncertain			Very Likely	
Moffat	72	11	14	27	7	3	8
Routt	57	12	11	29	13	7	13

For this configuration of the data, $N_1 = N_2 = 142$ and the realized value for Moffat County from Equation [3.4] is:

$$V = \sum_{i < j} n_i n_j (j - i) = (72)(11)(1) + (72)(14)(2) + (72)(27)(3) + (72)(7)(4) + (72)(3)(5) + (72)(8)(6) + \dots + (3)(8)(1) = 19,047.$$

$$V_{\max} = (c - 1) \left(\frac{N}{2} \right)^2 = (7 - 1) \left(\frac{142}{2} \right)^2 = 30,246$$

$$\text{and } IOV = \frac{V}{V_{\max}} = \frac{19,047}{30,246} = 0.62974.$$

$$IOC = 1 - 0.62974 = 0.37026.$$

Repeating the process for Routt County,

$$V = \sum_{i < j} n_i n_j (j - i) = (57)(12)(1) + (57)(11)(2) + (57)(29)(3) + (57)(13)(4) + (57)(7)(5) + (57)(13)(6) + \dots + (7)(13)(1) = 22,556.$$

$$V_{\max} = (c - 1) \left(\frac{N}{2} \right)^2 = (7 - 1) \left(\frac{142}{2} \right)^2 = 30,246,$$

$$\text{and } \frac{V}{V_{\max}} = \frac{22,556}{30,246} = 0.7458.$$

$$IOC = 1 - 0.7458 = 0.2542.$$

With 1,000,000 resamplings, the results are as follows:

Observed value of IOC_1 is	0.3703
Observed value of IOC_2 is	0.2542
Difference $IOC_1 - IOC_2$ is	0.1161
Two-tail P value ($P\ IOC_1 - IOC_2$)	0.0017
Lower-tail P value ($P\ IOC_1 - IOC_2$)	0.9983 .

For Moffat County, the magnitude of agreement is 37.03 percent of the maximum possible agreement. For Routt County, the magnitude of agreement is 25.42 percent of the maximum possible agreement. The probability of the observed difference of 11.61 percent, or greater, is less than a nominal $\alpha = 0.05$, resulting in rejection of the null hypothesis of no difference in agreement between the two counties. For a nondirectional test, the probability is simply twice the minimum of the upper-tail or lower-tail probability value.

ADDITIONAL STATISTICAL TESTS

Freeman's Coefficient of Determination

In addition to the IOV and IOC statistics for two independent samples, additional permutation tests are available for the analysis of data. Freeman's coefficient of determination, θ , (1965, pp. 108–119) is a measure of association that is appropriate when the research question involves a nominal independent variable and an ordinal dependent variable. Freeman's θ provides a measure of the degree to which one can predict responses on the dependent variable from the dependent

variable. There is a problem with Freeman's θ , notably, the shape of the sampling distribution is unknown and therefore a probability value cannot be obtained. The permutation equivalent of Freeman's θ , however, generates the discrete sampling distribution for the observed data, provides a value for the test statistic, and results in an exact or a resampling probability value, depending on the number of possible permutations.

Berry and Mielke (1992a, 1992b, 1992c) developed a permutation measure of association for a nominal independent variable and an ordinal dependent variable. This work was extended in 2006 when Berry, Johnston, and Mielke adapted a program by W. M. Patefield (1981) such that it preserved the order of the frequencies of the data. Specifically, this program allows researchers to calculate a variety of measures of association, including Freeman's θ (1965) for a binary independent variable and an ordinal dependent variable, i.e., a $2 \times c$ table configuration. Resampling methods generate a random sample of all possible arrangements of cell frequencies, drawn with replacement, given fixed marginal frequencies. The resampling probability values of the observed test statistic are the proportion of the tables generated through resampling that are equal to or greater than the observed test statistic (Berry, Johnston, and Mielke, 2006).

Interpretation of Freeman's θ is simply a comparison of the rankings of two independent samples standardized by the total number of comparisons. Freeman's θ norms between 0.0 and 1.0, with 1.0 indicating perfect association (the two independent categories are equally distributed among the categories of the dependent variable) and 0.0 indicating no association at all (Freeman, 1965, p. 112). Consider

the following example from the *Ranching in Colorado* survey. Respondents from the counties are compared for their response to, “Ranchers generally have good relations with their non-ranching neighbors.” The observed value of Freeman’s θ is 0.1777, representing an association is about 18 percent. Therefore, 17.77 percent of the comparisons among individuals in the two counties show consistent differences in relationships with non-ranching neighbors. Thus, any attempt to predict the dependent variable would be relatively unproductive (Freeman, 1965, p. 118). The permutation version allows the calculation of a probability value for the data, and for this example, $P = 0.0037$ which would be statistically significant at a nominal $\alpha = 0.05$.

Somer’s d_{yx}

Somer’s (1962) d_{yx} is an asymmetrical measure of association for two ordinal variables, x and y , where y is considered the dependent variable and x is the independent variable. Somer’s d_{yx} provides a measure of both the strength and the direction of a relationship. The calculation of Somer’s d_{yx} is straightforward

$$d_{yx} = \frac{C - D}{C + D + T_y}$$

where C is the number of concordant pairs, i.e., pairs of objects ranked in the same order on x and y , D is the number of discordant pairs, i.e., pairs of objects ranked in one order on x and reverse order on y , and T_y is the number of ties on y with differing values on x . Somer’s d_{yx} ranges between ± 1 with 0 indicating no association.

Positive values indicate the response is directly related to the independent variable and negative values indicate the response is inversely related to the independent variable.

Exact Chi-square

Berry and Mielke (1985) provided an exact test for chi-square that used a recursion algorithm resulting in very quick computing times. The program calculates all possible tables, given fixed row and column marginal values, and the associated probability values for each table. The exact chi-square probability value is the sum of the calculated probability values for those tables with chi-square values equal to or greater than the observed chi-square value. The following chapter utilizes the exact and resampling procedures for the Index of Ordinal Consensus, permutation versions of Freeman's (1965) θ , Somer's (1962) d_{yx} , and exact chi-square (Berry and Mielke, 1985).

CHAPTER FOUR

ANALYSIS

Ranchers in Routt Co. should be placed on the Endangered species list, even though it would not prevent their demise. Their only alternative is to sell and run a place for developers, and absentee hobby farmers. I for one, am sick of supporting the Nation and the world, by producing products for nothing, and paying costs of production by borrowing on reserve assets. Respondent 525.

OVERVIEW

Responses were analyzed for differences in five categories; grazing management practices, attitudes about the environment, public land use, level of involvement in civic, governmental, and ranching organizations, and feelings about community. Survey responses were examined through the comparison of differences between respondents in Moffat and Routt counties, and ranchers who were “new” to their property i.e., those who had 10 or fewer years on the ranch, and ranchers who were “old,” i.e., had been on the property from 11 years to 1 generation. The analyses of the data provided interesting results, in that there were few differences either between respondents in the two counties or between new and old ranchers.

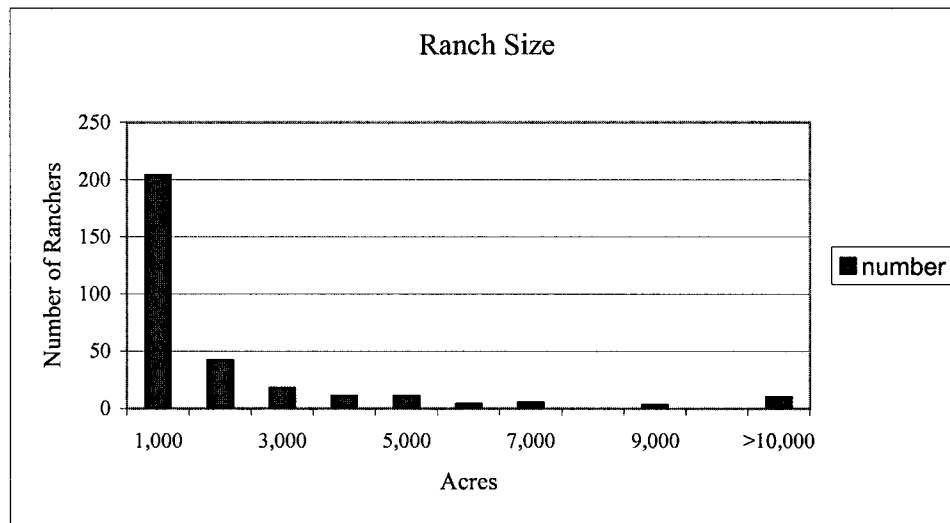
Respondents, in general, had high levels of consensus regarding grazing management practices, over half of the respondents indicated they used the all of the management practices included in the survey with one exception, restricting access to

riparian areas. Respondents were similar in environmental attitudes, feelings towards their community and involvement in local organization. Moffat County respondents tended to exhibit greater consensus on issues than respondents in Routt County, while consensus between new and old ranchers was more evenly divided between the two groups.

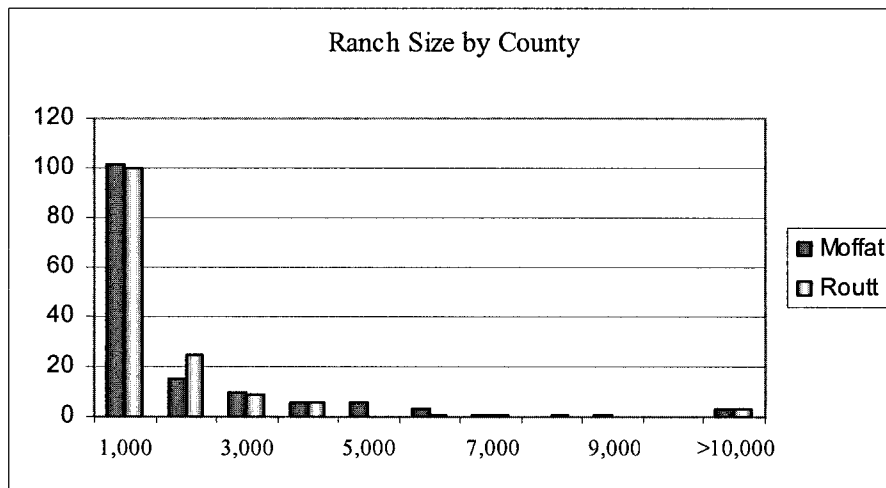
An overwhelming majority of respondents considered ranchers to be good stewards of the land and a similar proportion felt that national environmental groups were not good to work with. As with the management practices, few differences were found regarding environmental attitudes between ranchers in any of the four categories; i.e., Moffat and Routt counties, and new and old ranchers. In addition, there was strong consensus among respondents regarding public land use.

This research was intended to assess whether ranchers' beliefs and attitudes matched their behaviors. The results show consistency between beliefs, behaviors, and attitudes regardless of whether the comparison was between residents in the two counties or by length of time in ranching. Therefore, in general, the null hypotheses of no differences were supported for all but a few categories. The implication for "tip factors" is important because it does not appear that issues such as public land use and amenity development have fundamentally changed how ranchers feel about ranching. Moreover, ranchers indicated they were not inclined to earn income from tourist activities or through mineral sales. Interestingly, however, the written comments suggest that differences do exist and that future work with specific questions derived from ranchers' comments would add to this research.

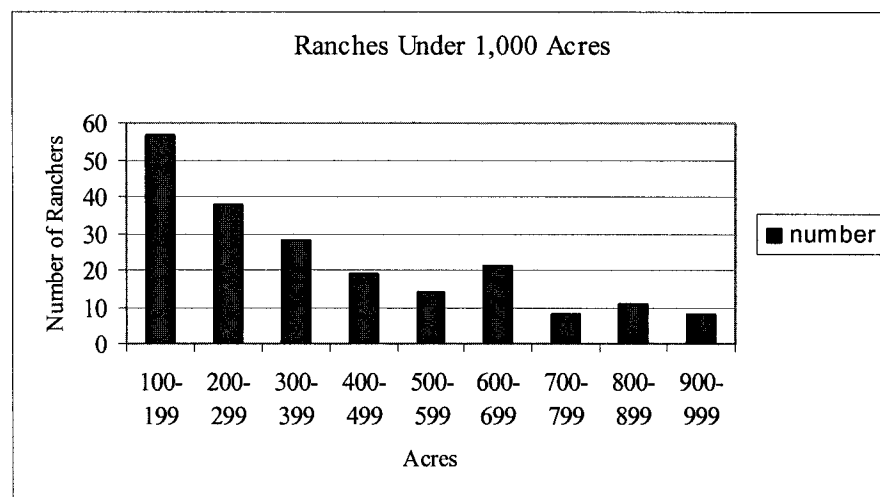
DESCRIPTIVE STATISTICS FOR SURVEY RESPONDENTS

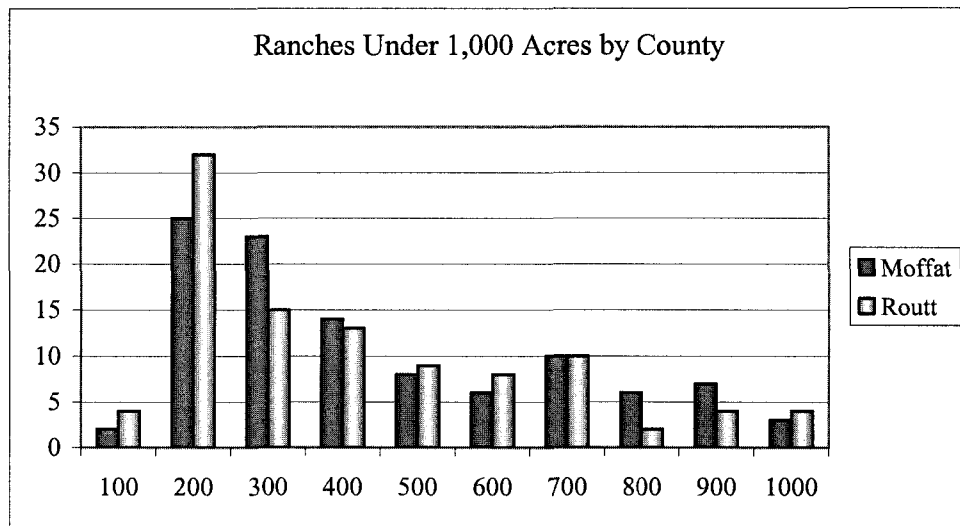


Of the 325 respondents, 318 individuals identified their county of residence and the remaining seven identified either more than one county or left the question blank. All those who responded to the question named Colorado counties as their county of residence and were overwhelmingly from Moffat ($N = 152$) and Routt ($N = 156$) counties, although a small number ($N = 10$) of respondents claimed “other Colorado County” as their place of residence. Because of the small number of other Colorado County ranchers, this analysis will focus on responses from Moffat and Routt counties. Ranches ranged in size from 37 acres ($n = 1$), to 70,000 acres ($n = 1$) with a median ranch size of 560.00 acres, mean ranch size of 1,835.65 acres, and the modal number of acres was 160 acres ($n = 15$). It is worth noting that single respondent with owned ranch property of 37 acres met the criteria for inclusion in the study through a combination of owned and managed property. All other respondents owned 100 ($n = 3$) acres or more.

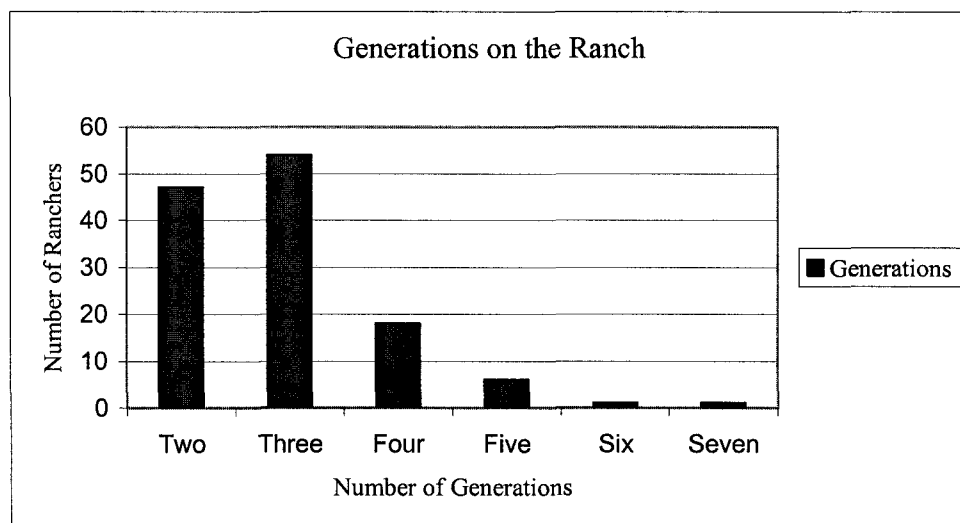


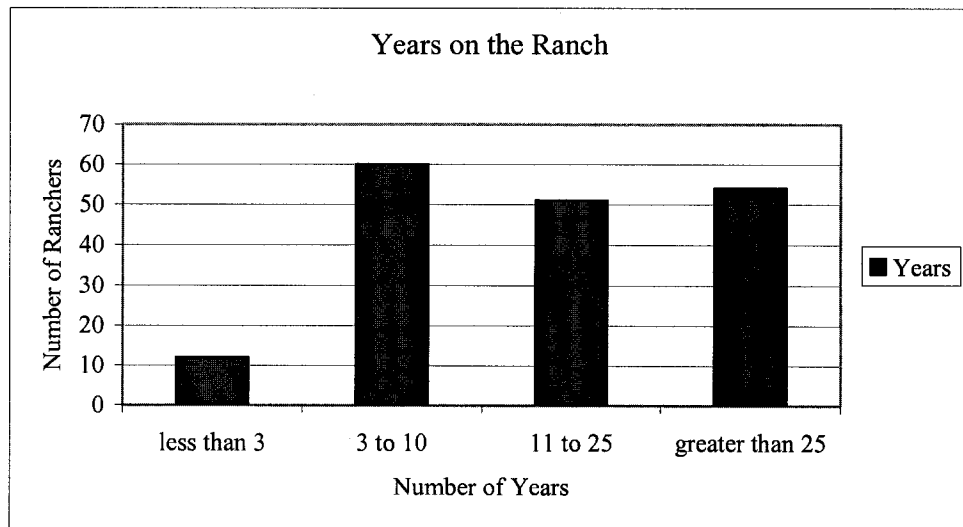
The respondent with the largest ranch, 70,000 acres, lived in Moffat County and the owner of the next largest ranch, 40,000 acres, did not indicate her or his county of residence. The large ranch property in Moffat County had the effect of creating a large positive skew in the data and therefore the average ranch size is larger in Moffat County than in Routt County: 1,809.67 acres in Moffat County and 1,369.42 acres in Routt County. Median ranch size was 550 acres in Moffat County and 500 acres in Routt County and modal ranch size was 160 acres for both counties.



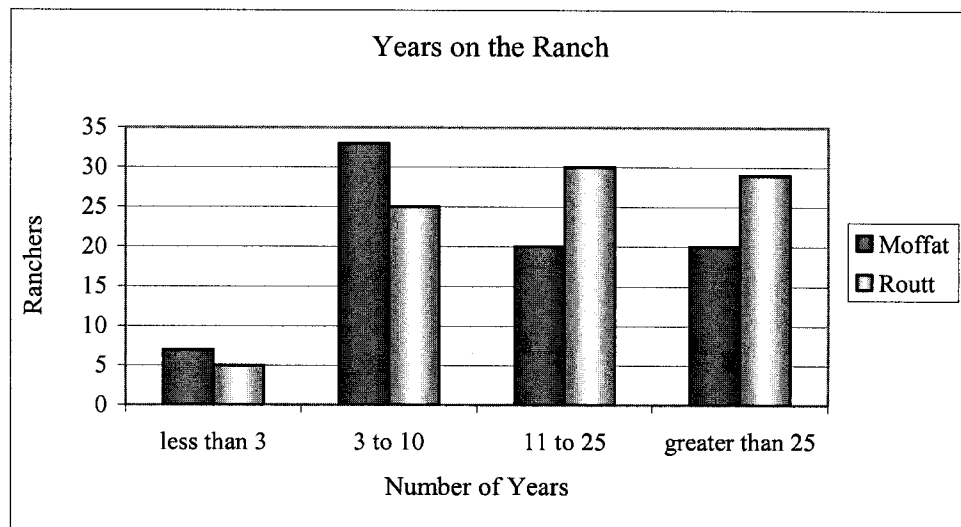


For both counties combined, the majority of ranches were under 1,000 acres; 204 ranches ranged between 100 and 999 acres and, on the upper end of the scale, ten ranches were 10,000 acres or greater. Four respondents leased the ranch property on which they operated their ranch, and one individual was the ranch manager but not an owner. A comparison of the distribution of ranches by size and county showed similar patterns in ranch size.



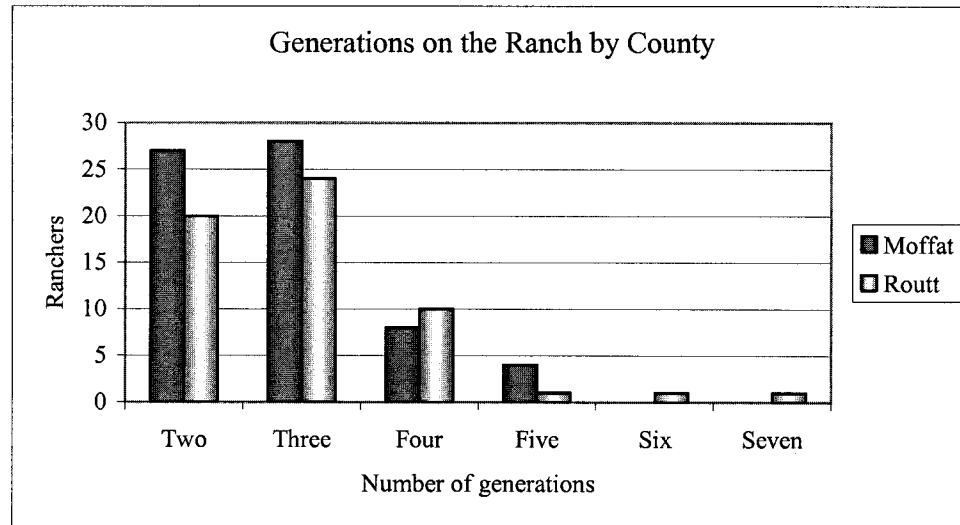


Three-hundred-four individuals responded to the question, “For how long have you or your family owned or operated this ranch or farm?” resulting in the fact that 177 individuals had owned their ranch property for one generation or less, and 127 respondents in the two counties had owned the property for two or more generations.



If one considers Moffat and Routt counties separately, the ownership patterns were similar; although ranchers who were relatively new to their properties were more

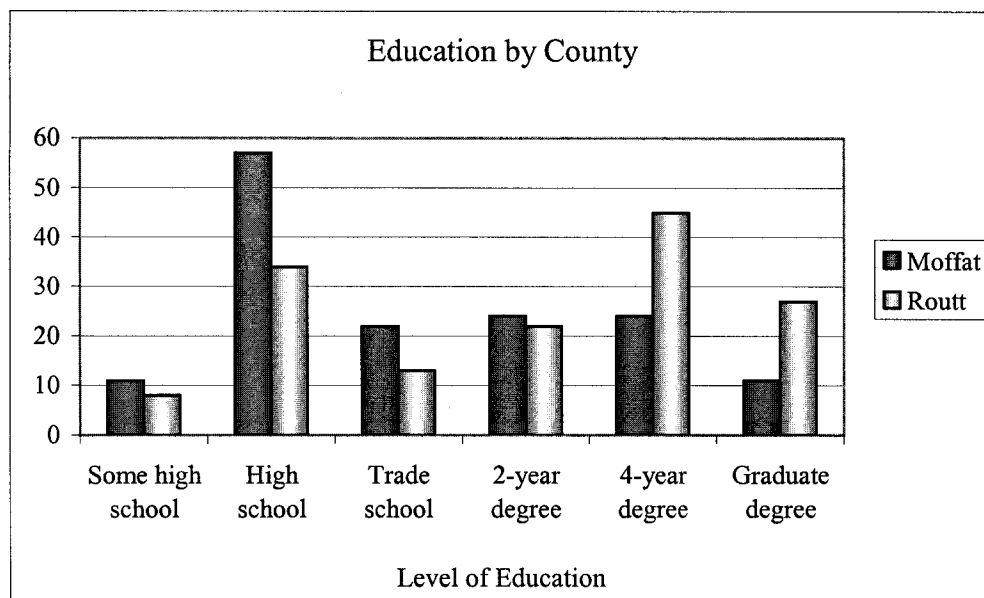
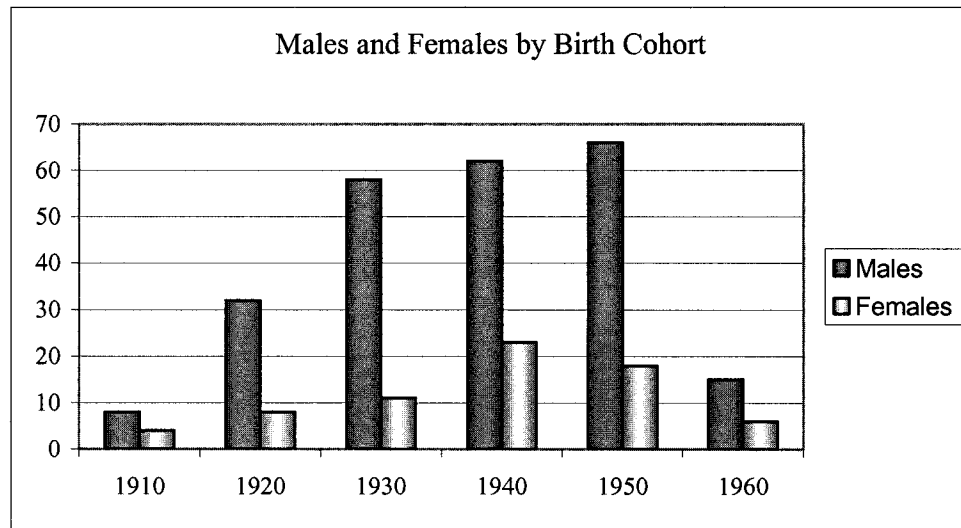
numerous in Moffat County by a small margin (40 ranchers have owned or operated their ranch for 10 years or less in Moffat County, versus 30 for the same period in Routt County).



In the two counties, a total of 127 respondents indicated that their families had owned their ranches for more than one generation and one Routt County respondent indicated the property had been in his or her family for seven generations. The general distribution of ranch ownership by generation indicated that for respondents with more than one generation on the ranch, two and three generations were the most common length of time for owners, and a similar pattern existed when the two counties were considered separately.

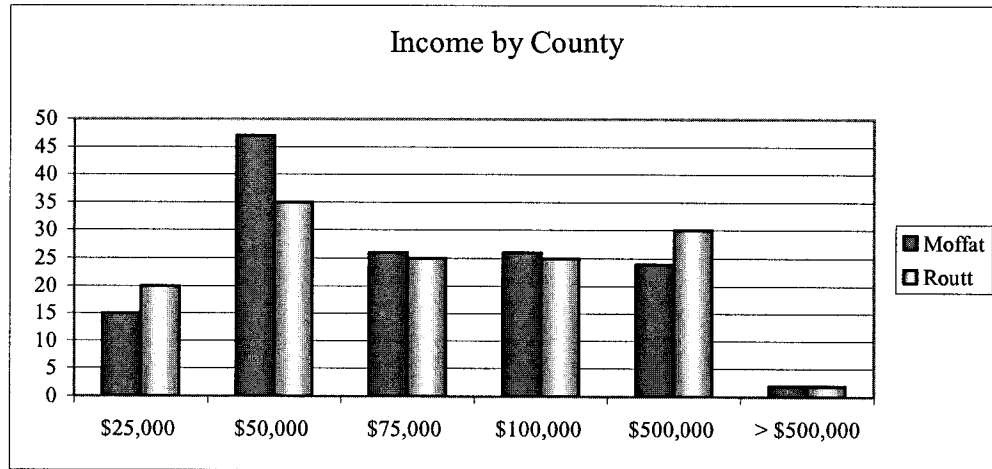
Among the respondents, males outnumbered females with 241 males and 72 females completing surveys. Ranchers' ages ranged from 36 to 91 years with an average age of 60.26 years, a median age of 61 years, and a modal age of 59 years. Average age for males was 59.4 years with a median of 58 years whereas for women,

the average age was 58.6 years with a median age of 58 years. A comparison of sex and birth cohort showed similar patterns in the distribution of ages irrespective of sex.

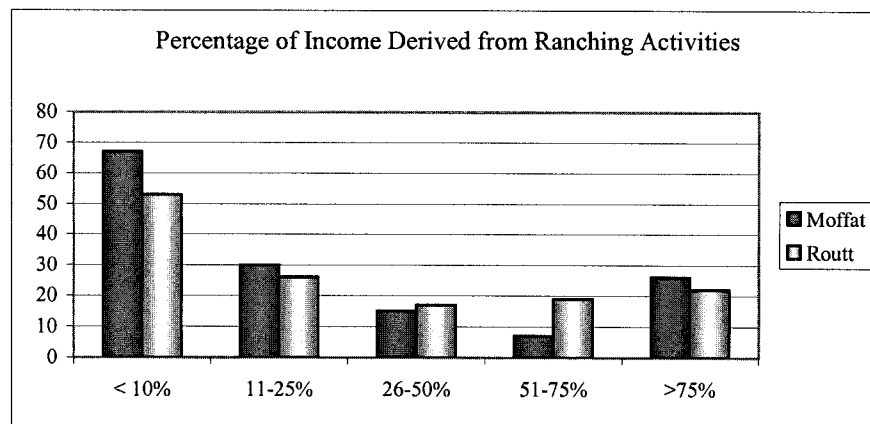


The general trend for educational attainment between Moffat and Routt counties was for respondents in Routt County to have more education than their counterparts in Moffat County.

Regarding income, responses indicated that household income, before taxes, was fairly evenly distributed between the two counties. Fifteen respondents in Moffat County and 20 respondents in Routt County indicated their total income was less than \$25,000 and 20 respondents in Routt County indicated their total income was less than \$25,000 and two respondents in each county indicated incomes greater than \$500,000.

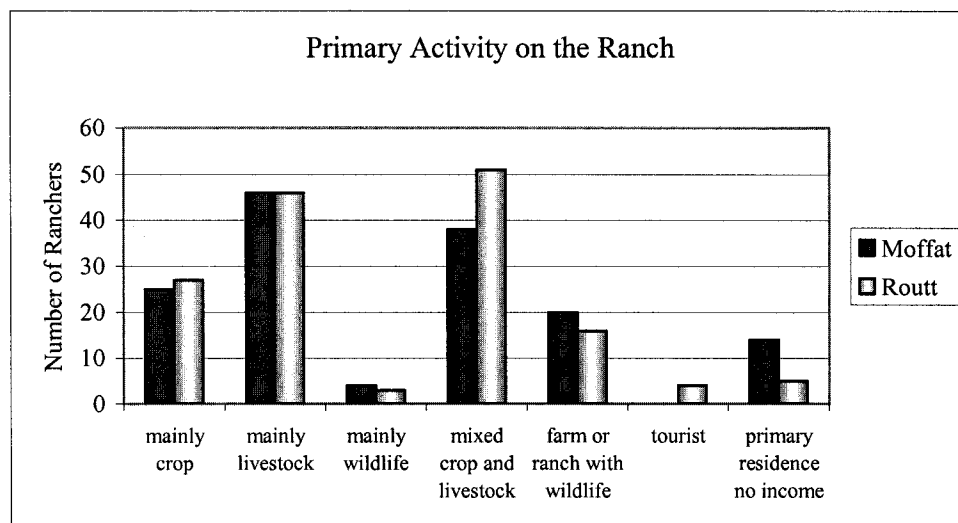


The modal category was the interval between \$25,001 and \$50,000, with 47 Moffat County ranchers (33.57%) and 35 Routt County ranchers (25.55%) indicating earnings in that interval. Fifty-two Moffat County ranchers and 57 Routt County ranchers had household incomes of \$100,000 or greater.



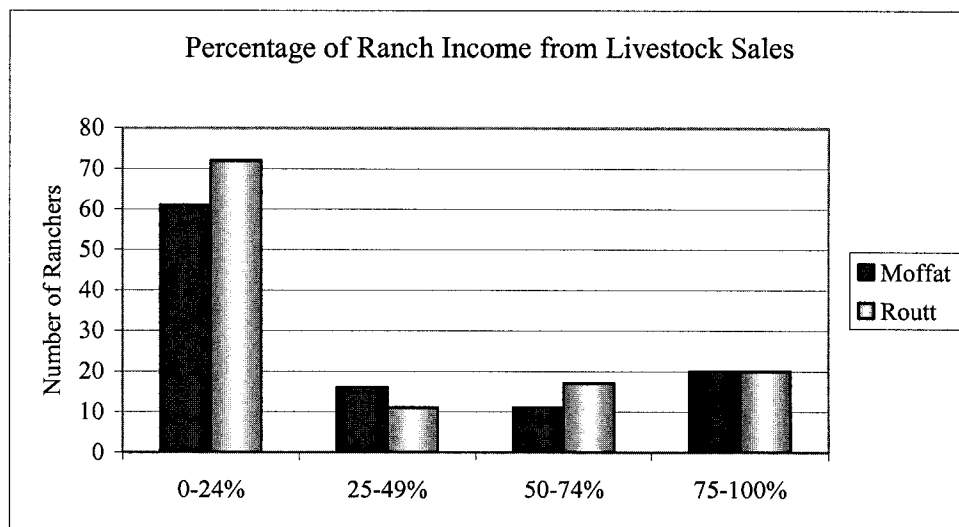
Perhaps a figure that is more important than the income reported by the ranchers, however, is the percentage of the household total income that resulted from the ranch. A comparison of the proportion of income from the ranch demonstrated that 119 of 283 (42.04%) who responded to the question earned ten percent or less of their net income from ranching activities. Interestingly, the four respondents in the highest income bracket were equally split between the two extremes: Two ranchers responded that 10 percent or less of their \$500,000 plus net incomes resulted from ranching activities, and two responded that over 75 percent of their income derived from ranching. Fifty-two of the 283 respondents (18.37%) reported over 75 percent of their income came from ranching.

Survey respondents were asked to indicate the primary activity on their ranch. Respondents chose from “mainly a crop,” “livestock,” or “wildlife” operation; a “mixed crop” or “livestock or ranch with wildlife operation”; and primarily as a “tourist” destination or “residence only.” Responses indicated that few ranchers



operated a wildlife operation (4 in Moffat and 3 in Routt counties) or tourist location (0 in Moffat and 4 in Routt counties), and 14 ranchers in Moffat County and 5 ranchers in Routt County did not rely on their ranches for any of their income.

Interestingly, many of the respondents in both counties indicated that none of their ranch income derived from livestock sales, with 37.68 percent of Moffat County respondents and 36.05 percent of Routt County respondents stating zero percent of their income came from the sales of livestock. The full range of responses is provided in quartiles below.



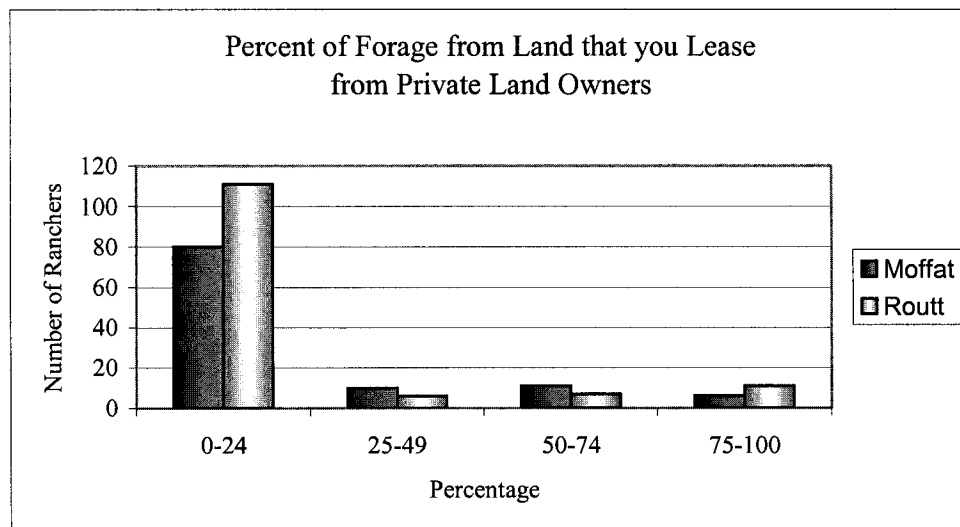
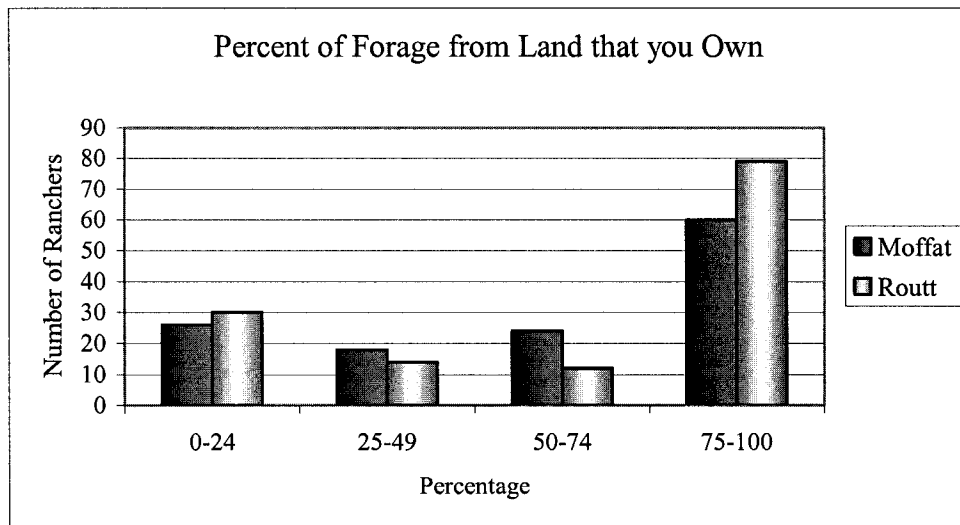
Residents were also asked to indicate what percent of their ranch income derived from sales of crops, livestock, or wildlife; fees for hunting or recreational activities; government programs; or from mineral sales and leases. For the percent of income from recreation related activities, 134 of 135 Moffat County ranchers answered that none of their income derived from recreation as compared to 131 of 146 Routt County residents. Only one respondent in Moffat County earned a small

percentage of his or her income through recreation (5% of the overall income for the ranch). In Routt County, six ranchers responded that 0–24 percent of their income was from recreation, six ranchers earned 25–55 percent of their income through recreation, and one each reported 60, 90, and 100 percent. Percent of income from mineral leases followed a very similar pattern with 122 of 137 and 138 of 146 respondents in Moffat and Routt counties answering that none of their income derived from mineral leases.

Regarding livestock, respondents reported the numbers of mature beef cows and bulls they had on January 1, 2001. For respondents in Moffat County, the range of answers was between zero (45.89%) and 2900 (1 of 147 respondents). For Routt County, the range was between zero (52.60%) and 980 cows or bulls (1 of 153 respondents). Respondents also noted how many heifers, stockers, and calves they had on their property for the same date. Again, the majority of respondents had no heifers, stockers, or calves (107 of 147 and 114 of 154 for Moffat and Routt counties, respectively), with a range of between 0 and 450 for Moffat County and 0 and 500 for Routt County. Among the other categories, 22 Moffat County and 11 Routt County residents had ewes, goats, rams, and bucks; 11 Moffat County residents had lambs or goat kids as compared to eight Routt County residents.

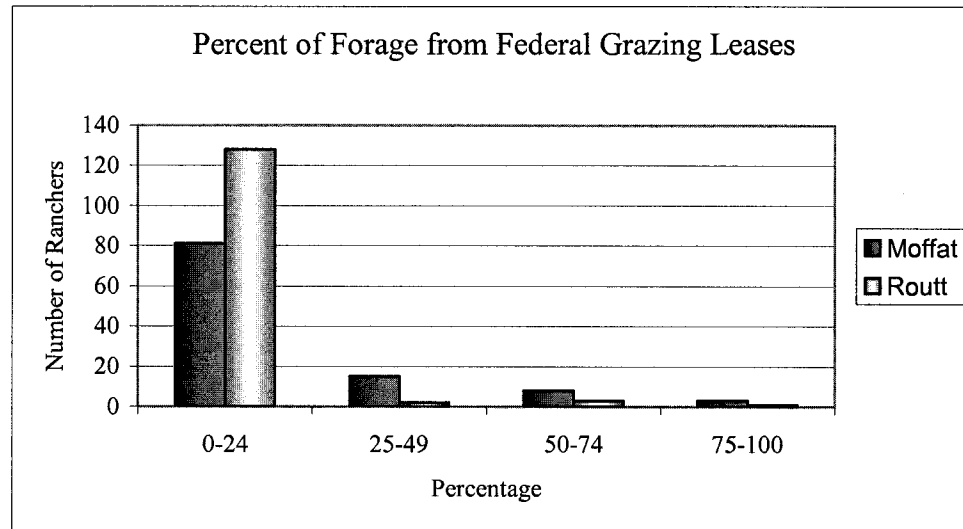
For the majority of respondents, the land they grazed cattle on was privately owned, with 46.88 percent of Moffat County residents indicating that 75 percent or more of their total forage came from private lands, and 58.52 percent of Routt County residents used private land for forage. Twenty eight of 107 (26.17%) ranchers in

Moffat County and 52 of 135 (38.52%) ranchers in Routt County had 100 percent of the total forage for their ranching operations come from land they owned privately.

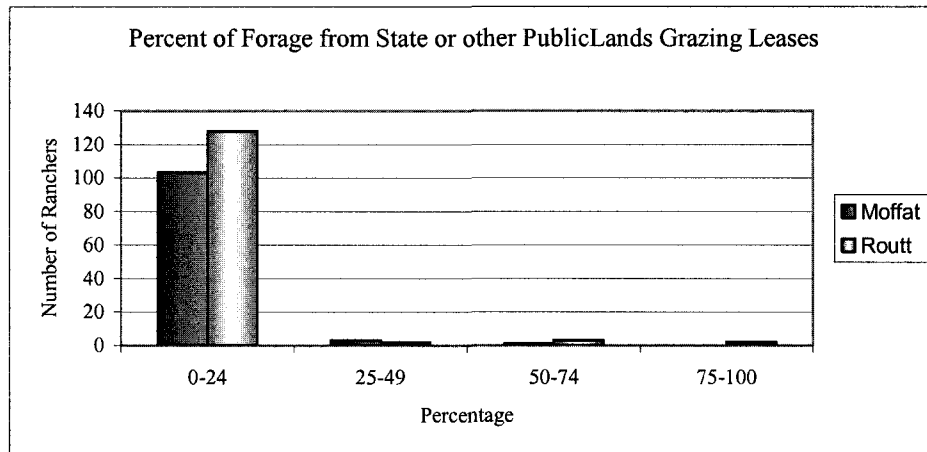


Respondents in both counties had very little reliance on lands leased from other private landowners, with 74.77 and 82.22 percent in Moffat and Routt counties, respectively, reporting less than 25 percent of total forage from leased private lands.

Only 6 percent of Moffat County ranchers and 8 percent of Routt County ranchers indicated their cattle grazed on lands where 75 percent or more of the forage resulted from leased, private land.



Most of the respondents did not use leased federal lands for grazing, with 75.70 and 95.52 percent of respondents in Moffat and Routt counties indicating that less than 25 percent of the total forage for their cattle operations came from federal lands grazing. Only three of 107 Moffat County ranchers and one of 134 Routt County respondents indicated that 75 percent or more of the total forage for their cattle operation came from leased federal lands.



The percent of forage from public or State grazing lands followed a similar pattern; 96.26 and 94.81 percent of ranchers in Moffat and Routt counties obtained less than 25 percent of their total forage from public or State lands, while no ranchers in Moffat County and two in Routt County relied on public or State lands from more than 74 percent of total forage.

DATA ANALYSIS

The theory of reasoned action posits that the primary determinant as to whether an individual will perform a certain action is his or her intention to do so (Ajzen, 1991, 2001; Ajzen and Fishbein 1977; Fishbein, 1963, 1967a, 1967b). Moreover, positive consequences that come from an action will be reflected in a positive attitude on the part of the actor. Finally, the amount of control that individuals believe they have over their own actions translates into behavior.

Ranchers by County and Attitudes Regarding the Environment

This portion of the analysis specifically considers the 308 respondents from the two primary counties, Moffat County and Routt County. As noted previously,

respondents in the two independent samples resulted in $N_1 = 152$ Moffat County residents and $N_2 = 156$ Routt County residents, although that number varies some among different questions. Section B5 of the survey included a series of 11 statements designed to tap ranchers' attitudes regarding the environment. Respondents were asked to note their level of agreement for each statement with ordered values ranging from -3, "strongly disagree" to +3, "strongly agree," and a middle value of 0 indicating neutrality. The 11 statements and the observed frequencies for each response are included below. In addition, the number of respondents is included for each statement, where N_M = Moffat County residents and N_R = Routt County residents.

1. The U.S. government should have authority in achieving environmental policy ($N_M = 148$, $N_R = 147$).

	-3	-2	-1	0	+1	+2	+3
Moffat	68	23	16	19	17	1	4
Routt	67	15	20	14	20	4	7

2. State governments should have authority in achieving environmental policy ($N_M = 148$, $N_R = 147$).

	-3	-2	-1	0	+1	+2	+3
Moffat	45	20	20	20	27	6	10
Routt	46	16	18	14	31	14	8

3. Local governments should have authority in achieving environmental policy ($N_M = 148$, $N_R = 146$).

	-3	-2	-1	0	+1	+2	+3
Moffat	27	9	10	18	31	20	33
Routt	29	11	9	14	36	19	28

4. Conservation easements are a means for achieving environmental policy ($N_M = 147$, $N_R = 147$).

	-3	-2	-1	0	+1	+2	+3
Moffat	28	11	8	49	34	7	10
Routt	24	6	9	35	30	21	22

5. Local environmental groups are good to work with ($N_M = 148$, $N_R = 144$).

	-3	-2	-1	0	+1	+2	+3
Moffat	48	12	21	39	14	8	6
Routt	41	13	15	31	22	12	10

6. National environmental groups are good to work with ($N_M = 145$, $N_R = 145$).

	-3	-2	-1	0	+1	+2	+3
Moffat	90	13	7	26	3	3	3
Routt	70	21	9	22	15	6	2

7. Ranchers are more concerned about the environment than profitability ($N_M = 145$, $N_R = 145$).

	-3	-2	-1	0	+1	+2	+3
Moffat	11	12	22	38	24	18	20
Routt	20	11	31	26	27	14	16

8. Ranchers are good environmentalists ($N_M = 148$, $N_R = 149$).

	-3	-2	-1	0	+1	+2	+3
Moffat	4	5	6	8	19	25	81
Routt	3	2	3	19	24	34	64

9. For ranchers to be profitable they may have to hurt the environment ($N_M = 145, N_R = 148$).

	-3	-2	-1	0	+1	+2	+3
Moffat	77	20	17	14	11	3	3
Routt	62	27	16	24	13	3	3

10. Environmental groups are knowledgeable about ranching and its effect on the environment ($N_M = 147, N_R = 149$).

	-3	-2	-1	0	+1	+2	+3
Moffat	118	13	5	4	2	4	1
Routt	93	22	12	8	6	4	4

11. Ranchers are more concerned about profits than the environment ($N_1 = 147, N_2 = 148$).

	-3	-2	-1	0	+1	+2	+3
Moffat	59	22	26	15	13	7	5
Routt	50	27	24	20	18	4	5

If all of those who returned surveys from the two counties responded to each statement, the $c = 7$ mutually exclusive, ordered categories from strongly disagree to strongly agree result in $7^{152+156}$ or 1.9507^{260} possible arrangements of the data. Even with slightly smaller response rates for each county, the number of possible arrangements of the data is much too large to calculate an exact probability, therefore, resampling is mandated. A resampling Index of Ordinal Consensus (*IOC*) was calculated for each statement, employing 1,000,000 resamplings and a random number seed of 23.

TABLE 2
INDEX OF ORDINAL CONSENSUS:
RANCHERS' AND THEIR ENVIRONMENT BY COUNTY

STATEMENT	OBSERVED		DIFFERENCE $IOC_1 - IOC_2$	TWO-SIDED PROBABILITY VALUE
	IOC_1^*	IOC_2^{**}		
1	0.4194	0.3412	+0.0781	0.0388 [†]
2	0.2880	0.2558	+0.0322	0.3990
3	0.2027	0.2002	+0.0024	0.9732
4	0.3607	0.2812	+0.0795	0.0406 [†]
5	0.3427	0.2708	+0.0720	0.0530
6	0.5050	0.4022	+0.1028	0.0086 [†]
7	0.3502	0.3116	+0.0386	0.3246
8	0.4955	0.5190	-0.0235	0.4826
9	0.4653	0.4267	+0.0386	0.4378
10	0.7269	0.5342	+0.1927	0.0000 [†]
11	0.3757	0.3807	-0.0050	0.8206

*1 = Moffat County

**2 = Routt County

† indicates significance at a nominal $\alpha = 0.05$

It is worth noting that with large sample sizes, it is possible for the index of ordinal consensus to result in statistically significant values that are not substantively significant. The difference between IOC_1 and IOC_2 may be considered a measure of effect size to aid in interpretation. In addition, the observed IOC_1 and IOC_2 values provide a measure of consensus within each county. Finally, the distribution of the frequencies in the observed cells allows the reader to ascertain how respondents in the two counties felt about the individual statements.

Examination of the observed data for Moffat County indicates that consensus on the statements ranged between 20.27 percent for Statement 3, "Local governments should have authority in achieving environmental policy," and 72.69 percent for Statement 10, "Environmental groups are knowledgeable about ranching and its effect

on the environment.” Consensus in Routt County ranged between 20.02 percent for Statement 3 and 53.42 percent for Statement 10. Differences ranged between 0.24 percent for Statement 3 and 19.27 percent for Statement 10.

It is interesting to note that for both counties, the smallest percentage of intra-county agreement was associated with Statement 3 and the largest percentage of intra-county agreement was associated with Statement 10. In addition, the sign of the differences indicates that for nine of the 11 statements, the amount of consensus was higher in Moffat County than in Routt County, although Routt County had higher levels of consensus for Statements 8 and 11. For Statements 1, 4, 6, and 10, the null hypothesis of no difference in consensus between respondents in the two counties was rejected at a nominal $\alpha = 0.05$.

Statement 1 asked respondents to note their level of agreement with the following: “The U.S. government should have authority in achieving environmental policy.” The magnitude of agreement for Moffat County was 41.94 percent as compared to 34.12 percent for Routt County. The probability of the observed difference of 7.81 percent or greater was less than a nominal $\alpha = 0.05$. Regarding Statement four: “Conservation easements are a means for achieving environmental policy,” for Moffat County, the magnitude of agreement was 36.07 percent of the maximum possible agreement; for Routt County, the magnitude of agreement was 28.12 percent of the maximum possible agreement. The probability of the observed difference of 7.95 percent, or greater, was less than a nominal $\alpha = 0.05$, resulting in rejection of the null hypothesis of no difference in agreement between the two counties.

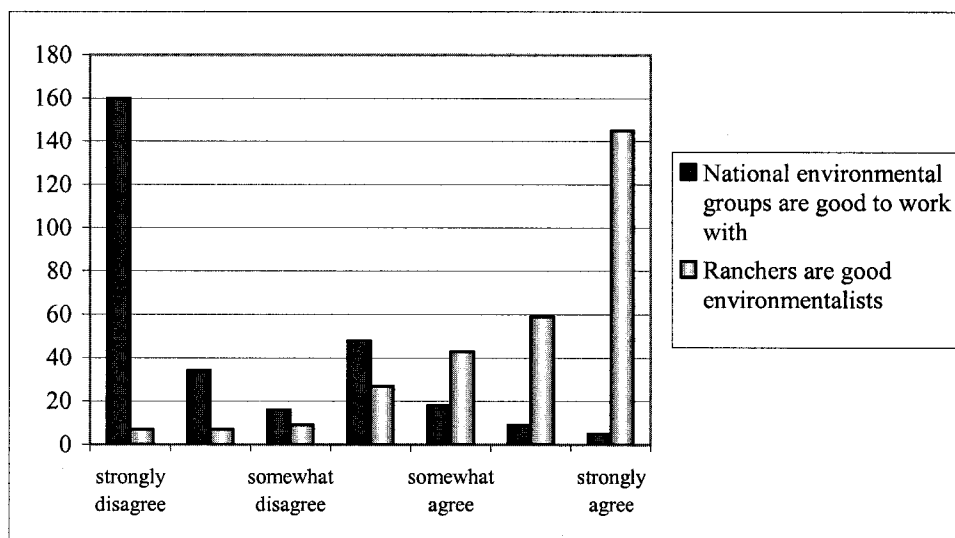
Similarly, Statement 6, “National environmental groups are good to work with” resulted in the following: For Moffat County, the magnitude of agreement was 50.50 percent of the maximum possible agreement; for Routt County, the magnitude of agreement was 40.22 percent of the maximum possible agreement. The probability of the observed difference of 10.28 percent, or greater, was less than a nominal $\alpha = 0.05$, resulting in rejection of the null hypothesis of no difference in agreement between the two counties.

Statement 10, “Environmental groups are knowledgeable about ranching and its effect on the environment” resulted in a magnitude of agreement of 72.69 percent for Moffat County and 53.42 percent of the maximum possible agreement for Routt County. The probability of the observed difference of 19.27 percent, or greater, was less than a nominal $\alpha = 0.05$, resulting in rejection of the null hypothesis of no difference in agreement between the two counties.

These results demonstrate that the respondents share similar attitudes whether they reside in the non-amenity growth county or the amenity growth county. The points at which they differ concerns whether the U. S. government should make environmental policy, whether conservation easements are a means for achieving environmental policy, attitudes about national level environmental groups, and whether environmental groups are knowledgeable about ranching.

Statements 6, “National environmental groups are good to work with,” and 8, “Ranchers are good environmentalists” generate an interesting pattern when the two sets of responses are superimposed onto the same graph. Residents in the two counties differed (statistically) on whether national environmental groups are good to work

with, but did not differ on whether they agreed with the statement, “Ranchers are good environmentalists.” A graph of the responses provides an illustration of how disparate the answers to these two statements are.



Just over 55 percent (55.17%) of respondents strongly disagreed with the statement that national environmental groups were good to work with, and overall 85.71 percent disagreed to some extent. Conversely, 48.82 percent of respondents strongly agreed with the statement, “Ranchers are good environmentalists,” and overall, 83.16 percent agreed to some extent.

The permutation version of Freeman’s (1965) θ was calculated for the same 11 statements, providing a measure of association for respondents in the two counties. Recall, Freeman’s θ is appropriate for a nominal-level independent variable and an ordinal-level dependent variable, e.g., county of residence and rancher’s opinion.

TABLE 3
FREEMAN'S MEASURE OF ASSOCIATION:
RANCHERS' AND THEIR ENVIRONMENT BY COUNTY

STATEMENT	TEST STATISTIC	TWO-SIDED PROBABILITY VALUE
1	+0.0450	0.4802
2	+0.0390	0.5534
3	+0.0359	0.5887
4	+0.1795	0.0064 [†]
5	+0.1035	0.1170
6	+0.1447	0.0188 [†]
7	+0.1093	0.1023
8	+0.0995	0.1128
9	+0.1105	0.0825
10	+0.1816	0.0007 [†]
11	+0.0572	0.3805

[†] indicates significance at a nominal $\alpha = 0.05$

For Statement 4, "Conservation easements are a means for achieving environmental Policy," the observed value of the resampling θ is 0.1795, representing an association of about 18 percent. Therefore, 18 percent of the comparisons among individuals in the two counties show consistent differences in opinions on conservation easements. Although this value is statistically significant (a function of the sample size), Freeman would suggest that the value does not allow prediction of the dependent variable. Similarly, for Statements 6, "National environmental groups are good to work with" and 10, "Environmental groups are knowledgeable about ranching and its effect on the environment," Freeman's θ indicates association of 14.47 percent and 18.16 percent, respectively, both of which are statistically significant at $\alpha = 0.05$.

Ranchers by County and Organizational Involvement

Section E8 of the survey provided an opportunity for respondents to indicate their level of involvement in different associations or organizations in their communities. In particular, respondents were asked whether they are involved in community government, a civic organization, and/or a ranch/farm organization with three response categories; “not involved,” “somewhat involved,” and “very involved.” For all respondents, engagement in organizations was as follows:

	Not Involved	Somewhat Involved	Very Involved
Civic organization	186 (70.19)*	56 (21.13)	23 (8.68)
Community government	139 (52.06)	85 (31.84)	43 (16.10)
Ranch organization	104 (37.01)	124 (44.13)	53 (18.86)

(* percentage of total)

Few respondents were involved in civic organizations, slightly more respondents were involved in community government, and at the upper end, more respondents were at least somewhat involved in ranch/farm organizations than not.

County-by-county comparisons were also considered for the level of involvement in civic organizations, community government, and ranch or farm organizations.

Regardless of the county of residence, ranchers were not very active in civic organizations, were somewhat more active in community government, and were the most likely to be involved in ranch and farm organizations.

		Civic Organization		
		Not Involved	Somewhat Involved	Very Involved
Moffat County		97 (74.05)*	27 (20.61)	7 (5.34)
Routt County		88 (70.40)	23 (18.40)	14 (11.20)

(* percentage of total)

		Community Government		
		Not Involved	Somewhat Involved	Very Involved
Moffat County		73 (55.73)*	40 (30.53)	18 (13.74)
Routt County		65 (51.18)	39 (30.71)	23 (18.11)

(* percentage of total)

		Ranch/Farm Organization		
		Not Involved	Somewhat Involved	Very Involved
Moffat County		55 (41.35)*	59 (44.36)	19 (14.29)
Routt County		49 (35.77)	58 (42.34)	30 (21.90)

(* percentage of total)

An exact chi-square was calculated to determine whether participation in civic organizations, community government, and farm or ranch organizations was independent of whether the respondent was a new rancher or an old rancher, resulting in no significant differences for any of the inter-county comparisons.

TABLE 4
RANCHER'S RESPONSES REGARDING
LEVEL OF INVOLVEMENT IN LOCAL ORGANIZATIONS

TABLE	EXACT CHI-SQUARE	EXACT PROBABILITY VALUE
1	2.95	0.2411
2	1.02	0.6065
3	2.77	0.2531

Ranchers by Length of Time in Ranching and Attitudes Regarding the Environment

The analysis of the Index of Ordinal Consensus between the two counties resulted in statistically significant differences in consensus on four statements and significant differences in Freeman's θ for three measures. Given those results, the decision was made to compare "new" ranchers and "old" ranchers. Recall, respondents were asked to answer how long they, or their family, had owned or operated this ranch." The respondents were coded into "less than or equal to 10 years," and "11 years to a single generation." This coding scheme was decided upon because of the relatively few number of new residents when compared to those who had been on the property for 11 years to multiple generations, which resulted in very small differences (e.g., 0.001) but all of which were statistically significant. For brevity, the two independent variables will be identified as "new" and "old." The observed results for the 11 attitudinal statements from section B5 in the survey are provided below. For each statement, N_1 = the number of new ranchers and N_2 = the number of old ranchers.

1. The U.S. government should have authority in achieving environmental policy ($N_1 = 71, N_2 = 98$).

	-3	-2	-1	0	+1	+2	+3
New	29	7	7	9	13	1	5
Old	42	16	18	4	11	4	6

2. State governments should have authority in achieving environmental policy ($N_1 = 71, N_2 = 98$).

	-3	-2	-1	0	+1	+2	+3
New	17	8	7	8	16	4	11
Old	26	17	15	6	21	7	6

3. Local governments should have authority in achieving environmental policy ($N_1 = 71, N_2 = 98$).

	-3	-2	-1	0	+1	+2	+3
New	9	4	5	10	16	8	19
Old	17	11	7	7	31	14	11

4. Conservation easements are a means for achieving environmental policy ($N_1 = 71, N_2 = 99$).

	-3	-2	-1	0	+1	+2	+3
New	10	4	4	17	21	7	8
Old	18	5	6	29	23	10	8

5. Local environmental groups are good to work with
($N_1 = 71, N_2 = 95$).

	-3	-2	-1	0	+1	+2	+3
New	21	8	6	21	10	1	4
Old	27	10	13	21	15	6	3

6. National environmental groups are good to work with
($N_1 = 70, N_2 = 96$).

	-3	-2	-1	0	+1	+2	+3
New	37	5	6	13	5	2	2
Old	46	16	7	18	6	2	1

7. Ranchers are more concerned about the environment than profitability ($N_1 = 70, N_2 = 97$).

	-3	-2	-1	0	+1	+2	+3
New	6	5	17	19	10	6	7
Old	11	4	23	17	19	12	11

8. Ranchers are good environmentalists ($N_1 = 71, N_2 = 99$).

	-3	-2	-1	0	+1	+2	+3
New	2	1	3	5	13	21	26
Old	3	2	3	10	16	17	48

9. For ranchers to be profitable they may have to hurt the environment ($N_1 = 71, N_2 = 99$).

	-3	-2	-1	0	+1	+2	+3
New	38	13	5	7	6	1	1
Old	35	17	17	14	10	4	2

10. Environmental groups are knowledgeable about ranching and its effect on the environment ($N_1 = 71, N_2 = 98$).

	-3	-2	-1	0	+1	+2	+3
New	49	11	5	6	1	1	1
Old	66	11	7	4	5	3	2

11. Ranchers are more concerned about profits than the environment ($N_1 = 70, N_2 = 99$).

	-3	-2	-1	0	+1	+2	+3
New	23	11	17	7	7	2	3
Old	31	18	19	10	14	4	3

For Table 5, the observed data for new ranchers indicates that consensus on the statements ranged between 19.89 percent for Statement 2, "State governments should have authority in achieving environmental policy" and 66.40 percent for Statement 10 "Environmental groups are knowledgeable about ranching and its effect on the environment." Consensus among old ranchers ranged between 25.89 percent for statement three and 55.28 percent for Statement 10. These results were similar to those for the county by county comparisons.

TABLE 5
INDEX OF ORDINAL CONSENSUS:
RANCHERS' AND THEIR ENVIRONMENT BY YEARS ON RANCH

STATEMENT	OBSERVED		DIFFERENCE $IOC_1 - IOC_2$	TWO-SIDED PROBABILITY VALUE
	IOC_{1*}	IOC_{2**}		
1	0.2870	0.3957	-0.1086	0.0016 [†]
2	0.1989	0.2788	-0.0798	0.1411
3	0.2532	0.2589	-0.0057	0.7790
4	0.3431	0.3333	+0.0098	0.3222
5	0.3431	0.3361	+0.0070	0.3616
6	0.4011	0.4627	-0.0616	0.0011 [†]
7	0.3916	0.3356	+0.0560	0.6910
8	0.5119	0.4829	-0.0290	0.0118 [†]
9	0.4939	0.3990	+0.0949	0.4873
10	0.6640	0.5528	+0.1112	0.0284 [†]
11	0.3883	0.3717	+0.0166	0.1541

*1 = new ranchers

**2 = old ranchers

[†] indicates significance at a nominal $\alpha = 0.05$

Differences ranged between 0.70 percent for statement five, "Local environmental groups are good to work with" with respondents in the two counties tending to align on the negative side (49.30% of the new ranchers disagreed with the statement and 54.35% of old ranchers disagreed). The greatest observed difference was 11.12 percent for statement 10 regarding environmental groups' knowledge about ranching.

For statements 1, 6, 8, and 10, the null hypothesis of no difference in the consensus between new ranchers and old ranchers was rejected at a nominal $\alpha = 0.05$. By way of comparison, county by county data resulted in significance on Statements 1, 4, 6, and 10. Statement 4, "Conservation easements are a means for achieving environmental policy" resulted in no difference between new and old ranchers, but

was significant when comparing Moffat and Routt counties. On the other hand, Statement 8, “Ranchers are good environmentalists,” provided significant differences when considered by length of time on the ranch but was not significantly different when comparing the counties.

Statement 1 asked respondents to assess their level of agreement with the following: “The U.S. government should have authority in achieving environmental policy.” The magnitude of agreement for new ranchers was 28.70 percent as compared to 39.57 for the old ranchers. The probability of the observed difference of 10.86 percent or greater was less than a nominal $\alpha = 0.05$.

Similarly, for Statement 6, “National environmental groups are good to work with” the magnitude of agreement for new ranchers was 40.11 percent of the maximum possible agreement. For old ranchers the magnitude of agreement was 46.27 percent of the maximum possible agreement. The probability of the observed difference of 6.16 percent, or greater, was less than a nominal $\alpha = 0.05$, resulting in rejection of the null hypothesis of no difference in agreement between new and old ranchers. Interestingly, new ranchers tended to be more favorable towards national environmental groups than old ranchers.

Statement 8, “Ranchers are good environmentalists,” resulted in a statistically significant difference between the new and old ranchers. The magnitude of agreement for new ranchers was 51.19 percent of the maximum possible agreement. For the old ranchers the level of agreement was 48.29 percent of the maximum possible agreement. The probability of the observed difference of 2.90 percent, or greater, was less than a nominal $\alpha = 0.05$, resulting in rejection of the null hypothesis of no

difference in agreement between the two counties, although in terms of substantive significance, the results are questionable.

As with the county by county comparisons, Statement 10 “Environmental groups are knowledgeable about ranching and its effect on the environment,” was statistically significant. Consensus among new ranchers was 66.40 percent of the maximum possible consensus, with respondents overwhelmingly (87.84%) disagreeing with the statement. Only three of the respondents agreed with the statement (0.04%), with one in each of the three possible “agree” categories. Consensus among old ranchers was 55.28 percent of the maximum possible agreement (85.71%) with ten respondents agreeing with the statement. The difference of 11.12 percent was significant at $\alpha = 0.05$.

These results indicate that the respondents share similar attitudes regardless of how long they have owned their ranch property. The points at which they differ are regarding whether the U. S. should have control over environmental policy, attitudes about national level environmental groups, whether ranchers are good environmentalists, and whether environmental groups are knowledgeable about ranching, as measured by strength of attitude.

The permutation version of Somer’s d_{yx} was calculated for the same 11 statements, providing a measure of association comparing respondents who had owned their ranch for ten years or less with those who had owned their ranch for more than ten years. Recall, Somer’s (1962) d_{yx} is appropriate for use with ordinal-level data, where y is the dependent variable and x is the independent variable, e.g., the statements of interest and number of years on the present ranch.

TABLE 6
SOMER'S d_{yx} MEASURE OF ASSOCIATION:
RANCHERS' AND THEIR ENVIRONMENT BY YEARS ON RANCH

STATEMENT	SOMER'S d_{yx} TEST STATISTIC	ONE-SIDED PROBABILITY VALUE
1	-0.0972	0.1311
2	-0.1295	0.0728
3	-0.1574	0.0383 [†]
4	-0.0918	0.1488
5	+0.0159	0.4300
6	+0.0009	0.4967
7	+0.0582	0.2582
8	+0.0690	0.2170
9	+0.2073	0.0078 [†]
10	+0.0382	0.3056
11	+0.0253	0.3888

[†] indicates significance at a nominal $\alpha = 0.05$

For Somer's d_{yx} , only Statements 3 and 9 were statistically significant. It is interesting to note that neither of these statements resulted in significant differences in previous analyses. Statement 3 asked respondents to assess level of agreement for "Local governments should have authority in achieving environmental policy," and resulted in a Somer's d_{yx} value of -0.1574. Thus, agreement with the statement is inversely related to length of time on the ranch, i.e., new ranchers agreed with the statement more than old ranchers. Statement 9, "For ranchers to be profitable they may have to hurt the environment," was statistically significant at $\alpha = 0.05$, Somer's $d_{yx} = +0.2073$ and this relationship is direct, i.e., old ranchers disagreed with the statement more than new ranchers.

Ranchers by County and Organizational Involvement

As with the county responses, Section E8 of the was compared for new and old ranchers regarding involvement in civic organizations, community government, and ranch/farm organizations with three response categories; “not involved,” “somewhat involved,” and “very involved.”

	<u>Civic Organization</u>		
	Not Involved	Somewhat Involved	Very Involved
New ranchers	50 (78.13)*	10 (15.63)	4 (6.25)
Old ranchers	57 (69.51)	15 (18.29)	10 (12.20)

(* percentage of total)

	<u>Community Government</u>		
	Not Involved	Somewhat Involved	Very Involved
New ranchers	33 (51.56)*	19 (29.69)	12 (18.75)
Old ranchers	44 (54.32)	26 (32.10)	11 (13.58)

(* percentage of total)

	<u>Ranch/Farm Organization</u>		
	Not Involved	Somewhat Involved	Very Involved
New ranchers	35 (52.24)*	25 (37.31)	7 (10.45)
Old ranchers	23 (26.14)	50 (56.82)	15 (17.05)

(* percentage of total)

An exact chi-square was calculated to determine whether participation in civic organizations, community government, and farm or ranch organizations was independent of whether the respondent was a new rancher or an old rancher. The results indicate that participation in community government is not independent of length of time in ranching. The results are provided in Table 6.

TABLE 7
RANCHER'S RESPONSES REGARDING
LEVEL OF INVOLVEMENT IN LOCAL ORGANIZATIONS

TABLE	EXACT CHI-SQUARE	EXACT PROBABILITY VALUE
1	1.84	0.3875
2	11.08	0.0038 [†]
3	1.02	0.6065

[†] indicates significance at a nominal $\alpha = 0.05$

Ranchers by County and Grazing Management Practices

Section A10 of the survey was designed to provide a measure of ranchers' behaviors regarding the environment. The six questions in the section allowed respondents to indicate which grazing management practices they generally employed on their ranches. These six questions required a yes/no response; either the respondent used a given practice or they did not. The observed data are provided below.

1. *Regularly monitor grazing resources.*

	No	Yes
Moffat	16	79
Routt	26	96

The overall percentage of respondents who indicated they regularly monitor grazing resources was 80.65 percent, with 83.16 percent of Moffat County ranchers answering in the affirmative and 78.69 percent of Routt County respondents indicating that they monitor grazing resources.

2. *Adjust stocking rates according to changes in amount of forage.*

	No	Yes
Moffat	14	80
Routt	27	94

The overall percentage of respondents who adjust stocking rates was 80.93 percent, with 85.11 percent of Moffat County ranchers who answered in the affirmative and 77.69 percent of Routt County respondents who indicated they adjust stocking rates.

3. *Use rotational grazing and/or resting system or herd livestock.*

	No	Yes
Moffat	25	69
Routt	40	81

The overall percentage of respondents who use rotational grazing was 69.77 percent, with 73.40 percent of Moffat County ranchers who answered in the affirmative and 66.94 percent of Routt County respondents who indicated they use rotational grazing.

4. *Provide relatively evenly distributed water points.*

	No	Yes
Moffat	23	70
Routt	48	71

The overall percentage of respondents who use evenly distributed water points was 66.51 percent, with 75.27 percent of Moffat County ranchers who answered yes and 59.66 percent of Routt County respondents who indicated they use evenly distributed water points.

5. *Place supplemental licks away from water points.*

	No	Yes
Moffat	30	64
Routt	31	90

The overall percentage of respondents who place supplemental licks away from water points was 71.63 percent, with 68.09 percent of Moffat County ranchers who answered yes and 74.38 percent of Routt County respondents who indicated they move supplemental licks away from water sources.

6. *Restrict livestock access to riparian areas.*

	No	Yes
Moffat	58	34
Routt	85	31

The overall percentage of respondents who restricted access to riparian areas was 31.25 percent, with 36.96 percent of Moffat County ranchers who answered yes and 26.72 percent of Routt County respondents who indicated they restrict access to riparian areas.

TABLE 8
RANCHER'S RESPONSES REGARDING
GRAZING MANAGEMENT PRACTICES

TABLE	EXACT CHI-SQUARE	EXACT PROBABILITY VALUE
1	0.684	0.4894
2	1.887	0.2205
3	1.047	0.3694
4	5.707	0.0192 [†]
5	1.032	0.3608
6	2.500	0.1328

[†] indicates significance at a nominal $\alpha = 0.05$

Over 50 percent of respondents monitored grazing resources, adjusted stocking rates, used rotational grazing or some form of resting system, evenly distributed water points, and placed supplemental licks away from water points. Only restricting livestock from riparian areas was utilized by fewer than 50 percent of respondents. In addition, Moffat County ranchers tended to use more of the grazing management practices, although more Routt County respondents indicated they placed supplemental licks away from water points. In order to test the significance of these findings, an exact chi-squared test was calculated for each table. The only statistically significant difference between respondents in Moffat and Routt counties was regarding the use of evenly distributed water points (See Table 8).

Ranchers by County and Participation in Conservation Programs

Section C4 of the survey was also designed as a behavioral measure and tapped into whether respondents participated, or had participated within the last five years, in conservation programs. The responses for the two counties are included below.

1. *USDA Conservation Reserve Program*

	No	Yes
Moffat	118	33
Routt	134	18

The overall percentage of respondents who participated in the program within the last five years was 16.83 percent, with 21.85 percent of Moffat County ranchers answering in the affirmative and 11.84 percent of Routt County respondents who said they participated in the USDA Conservation Reserve Program.

2. *USDA Environmental Quality Incentive Program*

	No	Yes
Moffat	129	20
Routt	135	17

The overall percentage of respondents who participated in the program within the last five years was 12.29 percent, with 13.42 percent of Moffat County ranchers answering in the affirmative and 11.18 percent of Routt County respondents who said they participated in the USDA Environmental Quality Incentive Program.

3. *State-sponsored private land wildlife management programs*

	No	Yes
Moffat	131	18
Routt	138	14

The overall percentage of respondents who participated in the program within the last five years was 10.63 percent, with 12.08 percent of Moffat County ranchers answering in the affirmative and 9.21 percent of Routt County respondents who said they participated in the State-sponsored private land wildlife management programs.

The final conservation program considered was cooperative wildlife management planning with other landowners:

4. *Cooperative wildlife management planning with other landowners*

	No	Yes
Moffat	138	12
Routt	143	9

The overall percentage of respondents who planned management with other landowners within the last five years was 6.95 percent, with 8.00 percent of Moffat County ranchers answering in the affirmative and 5.92 percent of Routt County respondents who said they planned wildlife management with other landowners.

An exact chi-square was calculated to determine whether participation in conservation programs was independent of the county of residence. The results are presented in Table 9. Only participation in the USDA Conservation Reserve Program was statistically significant for these data. Moreover, these results demonstrate that few ranchers in these two counties participate in any of the programs identified by the survey.

TABLE 9
RANCHER'S RESPONSES REGARDING
PARTICIPATION IN CONSERVATION PROGRAMS

TABLE	EXACT CHI-SQUARE	EXACT PROBABILITY VALUE
1	5.424	0.0217 [†]
2	0.350	0.6011
3	0.652	0.4585
4	0.504	0.5061

[†] indicates significance at a nominal $\alpha = 0.05$

Ranchers by Length of Time in Ranching and Grazing Management Practices

Analyses of the behavioral questions were repeated for the new versus old ranchers category.

1. *Regularly monitor grazing resources.*

	No	Yes
New	9	41
Old	16	62

The overall percentage of respondents who indicated they regularly monitor grazing resources was 80.47 percent, with 82.00 percent of new ranchers answering in the affirmative and 79.50 percent of old ranchers indicating that they monitor grazing resources.

2. *Adjust stocking rates according to changes in amount of forage.*

	No	Yes
New	14	80
Old	27	94

The overall percentage of respondents who adjust stocking rates was 79.53 percent, with 75.51 percent of new ranchers who answered in the affirmative and 82.05 percent of old ranchers who indicated they adjust stocking rates.

3. *Use rotational grazing and/or resting system or herd livestock.*

	No	Yes
New	14	35
Old	22	56

The overall percentage of respondents who use rotational grazing was 71.65 percent, with 71.43 percent of new ranchers who answered in the affirmative and 71.79 percent of old ranchers who indicated they use rotational grazing.

4. *Provide relatively evenly distributed water points.*

	No	Yes
New	17	31
Old	32	45

The overall percentage of respondents who use evenly distributed water points was 60.80 percent, with 64.58 percent of new ranchers who answered yes and 58.44 percent of old ranchers who indicated they use evenly distributed water points.

5. *Place supplemental licks away from water points.*

	No	Yes
New	20	29
Old	22	56

The overall percentage of respondents who place supplemental licks away from water points was 66.93 percent, with 59.18 percent of new ranchers who answered yes and 71.79 percent of old ranchers who indicated they move supplemental licks away from water sources.

6. *Restrict livestock access to riparian areas.*

	No	Yes
New	35	14
Old	54	20

The overall percentage of respondents who restricted access to riparian areas was 27.64 percent, with 28.57 percent of new ranchers who answered yes and 27.03 percent of old ranchers who indicated they restrict access to riparian areas.

TABLE 10
RANCHER'S RESPONSES REGARDING
GRAZING MANAGEMENT PRACTICES

TABLE	EXACT CHI-SQUARE	EXACT PROBABILITY VALUE
1	0.122	0.8213
2	0.517	0.5051
3	0.002	1.0000
4	0.468	0.5735
5	2.162	0.1758
6	0.035	1.0000

Over 50 percent of respondents monitored grazing resources, adjusted stocking rates, used rotational grazing or some form of resting system, evenly distributed water points, and placed supplemental licks away from water points. Again, only restricting livestock from riparian areas was utilized by fewer than 50 percent of respondents. In

order to test the significance of these findings, an exact chi-squared test was calculated for each table. The results are included in Table 10.

Ranchers by Length of Time in Ranching and Participation in Conservation Programs

Section C4 of the survey was also designed as a behavioral measure and tapped into whether respondents participated, or had participated within the last five years, in conservation programs. The responses for new and old ranchers are included below.

1. *USDA Conservation Reserve Program*

	No	Yes
New	64	8
Old	82	21

The overall percentage of respondents who participated in the program within the last five years was 16.57 percent, with 11.11 percent of new ranchers answering in the affirmative and 20.39 percent of Routt County respondents who said they participated in the USDA Conservation Reserve Program.

2. *USDA Environmental Quality Incentive Program*

	No	Yes
New	56	16
Old	92	9

The overall percentage of respondents who participated in the program within the last five years was 14.45 percent, with 22.22 percent of new ranchers answering in the

affirmative as compared to 8.91 percent of old ranchers who said they participated in the USDA Environmental Quality Incentive Program.

3. *State-sponsored private land wildlife management programs*

	No	Yes
New	66	6
Old	88	13

The overall percentage of respondents who participated in the program within the last five years was 10.98 percent, with 8.33 percent of new ranchers answering in the affirmative and 12.87 percent of old ranchers who said they participated in the State-sponsored private land wildlife management programs.

The final conservation program considered was cooperative wildlife management planning with other landowners:

4. *Cooperative wildlife management planning with other landowners*

	No	Yes
New	67	5
Old	96	6

The overall percentage of respondents who planned management with other landowners within the last five years was 6.32 percent, with 6.94 percent of new ranchers answering in the affirmative and 5.88 percent of old ranchers who said they planned wildlife management with other landowners.

TABLE 11
RANCHER'S RESPONSES REGARDING
PARTICIPATION IN CONSERVATION PROGRAMS

TABLE	EXACT CHI-SQUARE	EXACT PROBABILITY VALUE
1	2.638	0.1474
2	6.025	0.0167 [†]
3	0.885	0.4612
4	0.080	1.0000

[†] indicates significance at a nominal $\alpha = 0.05$

Only participation in the USDA Environmental Quality Incentive Program was statistically significant for these data. In addition, these results demonstrate that few ranchers in these two counties participate in any of the programs identified by the survey.

Ranchers by County and Feelings about Community

Section B7 of the survey tapped respondents' feelings about their community. Respondents were asked to note their level of agreement for each statement with ordered values ranging from -3; "strongly disagree" to +3; "strongly agree," and a middle value of 0 indicating neutrality. The 11 statements and the observed frequencies for each response are included below. In addition, the number of respondents is included for each statement, where N_M = Moffat County residents and N_R = Routt County residents.

1. Making a living in ranching in Colorado is more difficult now than 10 years ago ($N_M = 147$, $N_R = 152$).

	-3	-2	-1	0	+1	+2	+3
Moffat	3	3	3	13	15	24	86
Routt	4	5	4	10	12	25	92

2. I enjoy ranching in Colorado as much now as I did 10 years ago ($N_M = 145$, $N_R = 150$).

	-3	-2	-1	0	+1	+2	+3
Moffat	12	10	18	23	20	21	41
Routt	14	10	19	28	19	27	33

3. Population growth in my county threatens my ranching operation ($N_M = 146$, $N_R = 152$).

	-3	-2	-1	0	+1	+2	+3
Moffat	21	12	15	36	25	16	21
Routt	9	6	13	22	17	25	60

4. Population growth pays its own way in my county ($N_M = 143$, $N_R = 152$).

	-3	-2	-1	0	+1	+2	+3
Moffat	30	23	15	52	17	1	5
Routt	63	19	22	30	9	4	5

5. New residents have made my county a better place to live ($N_M = 145$, $N_R = 150$).

	-3	-2	-1	0	+1	+2	+3
Moffat	40	22	19	44	11	6	3
Routt	56	26	20	24	9	10	5

6. My county is a very good place to live ($N_M = 145$, $N_R = 150$).

	-3	-2	-1	0	+1	+2	+3
Moffat	1	2	4	16	30	36	57
Routt	6	4	7	12	23	42	56

7. The quality of life in my county is good ($N_M = 140$, $N_R = 149$).

	-3	-2	-1	0	+1	+2	+3
Moffat	1	0	4	15	32	37	51
Routt	1	6	5	10	27	50	50

8. Ranching is LESS important to my county's quality of life than 10 years ago ($N_M = 144$, $N_R = 153$).

	-3	-2	-1	0	+1	+2	+3
Moffat	20	12	10	15	23	34	30
Routt	17	12	6	7	10	26	75

9. My county is a friendly place to live ($N_M = 144$, $N_R = 150$).

	-3	-2	-1	0	+1	+2	+3
Moffat	1	3	5	15	37	44	39
Routt	6	6	7	16	37	38	40

10. Ranchers generally have good relations with their non-ranching neighbors ($N_M = 143$, $N_R = 151$).

	-3	-2	-1	0	+1	+2	+3
Moffat	7	9	15	16	44	30	22
Routt	14	13	20	29	32	31	12

11. I identify more with a region than a particular community (for example Steamboat or Craig) ($N_M = 144$, $N_R = 149$).

	-3	-2	-1	0	+1	+2	+3
Moffat	13	9	8	32	25	25	32
Routt	6	5	10	33	28	32	35

For Table 12, the observed data for Moffat County indicates that consensus on the statements ranged between 23.33 percent for Statement 8, “Ranching is less important to my county’s quality of life than 10 years ago,” and 57.79 percent for Statement 7 “The quality of life in my county is good.” Consensus in Routt County had low and high values for the same two statements and ranged between 26.52 percent for Statement 8 and 53.06 percent for Statement 7.

TABLE 12
INDEX OF ORDINAL CONSENSUS:
RANCHERS AND COMMUNITY BY COUNTY

STATEMENT	OBSERVED		DIFFERENCE	TWO-SIDED
	IOC_1^*	IOC_2^{**}	$IOC_1 - IOC_2$	PROBABILITY VALUE
1	0.5500	0.5306	+0.0194	0.9868
2	0.2682	0.2771	-0.0089	0.7778
3	0.2830	0.3326	-0.0496	0.1545
4	0.4284	0.4006	+0.0278	0.8644
5	0.4077	0.3627	+0.0450	0.3630
6	0.5503	0.4550	+0.0953	0.0357 [†]
7	0.5759	0.5366	+0.0393	0.9991
8	0.2333	0.2652	-0.0318	0.3934
9	0.5513	0.4356	+0.1158	0.0143 [†]
10	0.4013	0.3519	+0.0495	0.3728
11	0.3109	0.4091	-0.0982	0.0064 [†]

*1 = Moffat County

**2 = Routt County

[†] indicates significance at a nominal $\alpha = 0.05$

Differences ranged between 0.89 percent for Statement 2, “I enjoy ranching in Colorado as much now as I did 10 years ago,” and 11.58 percent for Statement 9, “My County is a friendly place to live.” The sign of the differences indicates that for seven of the 11 statements, the amount of consensus was higher in Moffat County than in Routt County, although Routt County had higher levels of consensus for Statements 2, 3, 8, and 11. For Statements 6, 9, and 11, the null hypothesis of no difference in consensus between respondents in the two counties was rejected at a nominal $\alpha = 0.05$.

Statement 6 asked respondents to note their level of agreement with the following: “My County is a very good place to live.” The magnitude of agreement for Moffat County was 55.03 percent as compared to 45.50 percent for Routt County. The probability of the observed difference of 9.53 percent or greater was less than a nominal $\alpha = 0.05$.

Regarding Statement 9: “My county is a friendly place to live,” for Moffat County, the magnitude of agreement was 55.13 percent of the maximum possible agreement. For Routt County, the magnitude of agreement was 43.56 percent of the maximum possible agreement. The probability of the observed difference of 11.58 percent, or greater, was less than a nominal $\alpha = 0.05$, resulting in rejection of the null hypothesis of no difference in agreement between the two counties. Finally, Statement 11, “I identify more with a region than a particular community (for example, Steamboat or Craig),” the magnitude of agreement for Moffat County was 31.09 as compared to 40.91 for Routt County. The difference of 9.82 percent was statistically significant at $\alpha = 0.05$.

Freeman's (1965) θ measure of association was calculated for the statements regarding community. Statements 3, 4, 8, and 10 resulted in statistically significant differences. For Statement 3, "Population growth in my county threatens my ranching operation" the observed value of the resampling θ is 0.3456, representing an association is about 35 percent. Therefore, 34.56 percent of the comparisons among individuals in the two counties show consistent differences in opinions on population growth.

TABLE 13
FREEMAN'S MEASURE OF ASSOCIATION:
RANCHERS AND COMMUNITY BY COUNTY

STATEMENT	TEST STATISTIC	TWO-SIDED PROBABILITY VALUE
1	+0.0169	0.7752
2	+0.0524	0.4299
3	+0.3456	0.0000 [†]
4	+0.2369	0.0003 [†]
5	+0.1145	0.0806
6	+0.0263	0.6833
7	+0.0059	0.9280
8	+0.2648	0.0000 [†]
9	+0.0709	0.2794
10	+0.1777	0.0072 [†]
11	+0.0864	0.1934

[†] indicates significance at a nominal $\alpha = 0.05$

Similarly, for Statement 4, "Population growth pays its own way in my county," the measure of association was 0.2369 or an association of 23.69 percent. For Statement 8, "Ranching is less important to my county's quality of life than 10 years ago," the measure of association was 0.2648 and for Statement 10, "Ranchers

generally have good relations with their non-ranching neighbors” Freeman’s θ was 0.1777.

Ranchers by Length of Time in Ranching and Feelings about Community

The analyses were repeated comparing new and old ranchers. Recall, new ranchers are those who have been on the current ranching operation for ten years or less and old ranchers are those who have been on the current ranch property for longer than ten years to one generation. The observed results for the eleven statements identified previously are provided below. For each statement, N_1 = the number of new ranchers and N_2 = the number of old ranchers.

1. Making a living in ranching in Colorado is more difficult now than 10 years ago ($N_1 = 71, N_2 = 101$).

	-3	-2	-1	0	+1	+2	+3
New	2	0	4	5	8	11	41
Old	2	4	1	9	10	17	58

2. I enjoy ranching in Colorado as much now as I did 10 years ago ($N_1 = 70, N_2 = 99$).

	-3	-2	-1	0	+1	+2	+3
New	9	1	8	21	11	7	13
Old	8	8	13	12	14	18	26

3. Population growth in my county threatens my ranching operation ($N_1 = 71, N_2 = 100$).

	-3	-2	-1	0	+1	+2	+3
New	8	8	6	15	13	9	12
Old	10	4	10	14	16	19	27

4. Population growth pays its own way in my county
($N_1 = 71, N_2 = 100$).

	-3	-2	-1	0	+1	+2	+3
New	16	12	10	19	9	3	2
Old	26	14	16	29	8	3	4

5. New residents have made my county a better place to live
($N_1 = 71, N_2 = 99$).

	-3	-2	-1	0	+1	+2	+3
New	14	14	14	18	6	4	1
Old	33	16	8	25	9	6	2

6. My county is a very good place to live ($N_1 = 71, N_2 = 99$).

	-3	-2	-1	0	+1	+2	+3
New	1	1	1	6	15	20	27
Old	3	2	4	7	18	25	40

7. The quality of life in my county is good ($N_1 = 69, N_2 = 99$).

	-3	-2	-1	0	+1	+2	+3
New	0	1	1	4	13	26	24
Old	2	3	2	7	19	31	35

8. Ranching is LESS important to my county's quality of life than
10 years ago ($N_1 = 70, N_2 = 101$).

	-3	-2	-1	0	+1	+2	+3
New	10	6	7	9	11	10	17
Old	10	9	2	6	14	20	40

9. My county is a friendly place to live ($N_1 = 70, N_2 = 100$).

	-3	-2	-1	0	+1	+2	+3
New	1	1	2	5	24	18	19
Old	3	1	4	7	23	29	33

10. Ranchers generally have good relations with their non-ranching neighbors ($N_1 = 70, N_2 = 100$).

	-3	-2	-1	0	+1	+2	+3
New	3	5	9	14	15	18	6
Old	5	7	11	11	32	21	13

11. I identify more with a region than a particular community (for example Steamboat or Craig) ($N_1 = 70, N_2 = 98$).

	-3	-2	-1	0	+1	+2	+3
New	4	4	4	17	13	11	17
Old	8	4	9	23	17	19	18

For Table 14, the observed data for new ranchers indicates that consensus on the statements ranged between 20.78 percent for Statement 8, "Ranching is less important to my county's quality of life than 10 years ago," and 63.45 percent for Statement 10 "The quality of life in my county is good." Consensus among old ranchers ranged between 26.65 percent for Statement 2, "I enjoy ranching in Colorado as much now as I did 10 years ago," and 52.95 percent for Statement 7, "The quality of life in my county is good."

Differences ranged between 0.0025 percent for Statement 4, “Population growth pays its own way in my county,” with respondents in the two counties tending to align on the negative side (53.52% for new ranchers and 56.00% for old ranchers) and a high of 11.12 percent for Statement 10 with the majority of respondents agreeing with the statement (55.71% of those in new ranchers agreed and 66% of those old ranchers agreed). For Statements 1, 6, 7, 9, and 10, the null hypothesis of no difference in the consensus between new ranchers and old ranchers was rejected at a nominal $\alpha = 0.05$. By way of comparison, county-by-county data resulted in significance on statements 6, 9, and 11.

TABLE 14
INDEX OF ORDINAL CONSENSUS:
RANCHERS’ AND COMMUNITY BY YEARS ON RANCH

STATEMENT	OBSERVED		DIFFERENCE	TWO-SIDED
	IOC_1^*	IOC_2^{**}	$IOC_1 - IOC_2$	PROBABILITY VALUE
1	0.5312	0.5275	+0.0038	0.0005 [†]
2	0.3150	0.2665	+0.0484	0.7658
3	0.2754	0.2841	-0.0087	0.5201
4	0.3910	0.3935	-0.0025	0.0551
5	0.4339	0.3648	+0.0691	0.5409
6	0.5653	0.4921	+0.0732	0.0370 [†]
7	0.6345	0.5295	+0.1049	0.0159 [†]
8	0.2078	0.2780	-0.0703	0.1778
9	0.5635	0.5165	+0.0471	0.0036 [†]
10	0.4156	0.4053	+0.0104	0.0491 [†]
11	0.3576	0.3446	+0.0130	0.2744

*1 = new ranchers

**2 = old ranchers

[†] indicates significance at a nominal $\alpha = 0.05$

For Statements 1, 9, and 10, the values are statistically significant but are not substantively significant, with differences of 0.38 percent, 4.71 percent, and 1.04

percent, respectively. The statistical significance results from the distributions of observed values among the seven categories. For example, consider the first statement and its observed frequencies:

1. Making a living in ranching in Colorado is more difficult now than 10 years ago ($N_1 = 71, N_2 = 101$).

	-3	-2	-1	0	+1	+2	+3
New	2	0	4	5	8	11	41
Old	2	4	1	9	10	17	58

The combination of fairly large sample sizes for the two groups and the extreme amount of consensus in the agree categories results in virtually no difference in consensus between new and old ranchers, $IOC_1 - IOC_2 = 0.0038$, but because of the extreme nature of the observed table, the results are statistically significant, $P = 0.0005$.

Statements 6 and 7 are also statistically significant, but have differences that are somewhat higher, with observed differences of 7.32 and 10.49 percent, respectively. Statements 6 and 7 asked respondents to state their level of agreement with, "My county is a very good place to live" and "The quality of life in my county is good," respectively. Although the substantive significance of even the statistically significant statements was fairly small, these analyses are important because the fact that there are relatively small differences between new and old ranchers for these statements is interesting and likely contrary to what might be expected. Somer's (1962) d_{yx} is a measure of association between two ordinal variables and allows for interpretation of the level of significance.

The permutation version of Somer's (1962) d_{yx} was calculated for the same 11 statements, comparing respondents who have owned their ranch for ten years or less with those who have owned their ranch for more than ten years. For Somer's d_{yx} , only Statements 3 and 8 are significant. Statement 3 asked respondents to assess level of agreement for "Public lands should be closed for recreational uses," and the results indicate a direct relationship between response and length of time in ranching, that is, as length of time is ranching increases, agreement with the statement increases. Statement 8, "Ranching is less important to my county's quality of life than 10 years ago," also results in a direct relationship; length of time in ranching is associated with more overall agreement with the statement. The results for Somer's d_{yx} are presented in Table 15.

TABLE 15
SOMER'S d_{yx} MEASURE OF ASSOCIATION:
RANCHERS' AND COMMUNITY BY YEARS ON RANCH

STATEMENT	SOMER'S d_{yx} TEST STATISTIC	TWO-SIDED PROBABILITY VALUE
1	+0.0001	0.4991
2	+0.1177	0.0949
3	+0.1768	0.0228 [†]
4	-0.0434	0.3110
5	-0.0787	0.1872
6	-0.0031	0.4857
7	-0.0464	0.2971
8	+0.2209	0.0060 [†]
9	+0.0737	0.1990
10	+0.0587	0.2534
11	-0.0628	0.2404

[†] indicates significance at a nominal $\alpha = 0.05$

Ranchers by County and Attitudes Regarding Public Lands

The final aspect of the survey that was considered was respondents' attitudes towards public lands, first with county by county comparisons followed by new and old ranchers.

- Public lands should be open for recreational uses with no conditions or limitations ($N_M = 141$, $N_R = 146$).

	-3	-2	-1	0	+1	+2	+3
Moffat	68	19	19	10	8	1	16
Routt	77	14	15	18	6	8	8

- Public lands should be open for recreational uses with limitations ($N_M = 143$, $N_R = 144$).

	-3	-2	-1	0	+1	+2	+3
Moffat	9	4	6	9	34	28	53
Routt	7	2	9	11	36	32	47

- Public lands should be closed for recreational uses ($N_M = 145$, $N_R = 144$).

	-3	-2	-1	0	+1	+2	+3
Moffat	78	17	25	14	3	3	5
Routt	72	22	18	21	6	2	3

- Public lands should be primarily used as a wildlife habitat ($N_M = 144$, $N_R = 145$).

	-3	-2	-1	0	+1	+2	+3
Moffat	70	19	12	13	9	9	12
Routt	57	21	14	13	19	8	13

5. The public should have access to public land through private land ($N_M = 147$, $N_R = 148$).

	-3	-2	-1	0	+1	+2	+3
Moffat	95	12	4	12	6	6	12
Routt	105	7	6	10	4	5	11

For Table 16, the observed data for Moffat County indicates that consensus on the statements ranged between 29.25 percent for Statement 4, “Public lands should be primarily used as a wildlife habitat,” and 48.48 percent for Statement 3 “Public lands should be closed for recreational uses.” Consensus in Routt County ranged between 25.04 percent for Statement 4 and 48.40 percent for Statement 3. Differences ranged between 0.08 percent for Statement 3 and a high of 6.45 percent for Statement 5. None of the differences were statistically significant indicating no differences between the two counties in consensus on the issue.

TABLE 16
INDEX OF ORDINAL CONSENSUS:
RANCHERS’ AND PUBLIC LANDS BY COUNTY

STATEMENT	OBSERVED		DIFFERENCE	TWO-SIDED
	IOC_1^*	IOC_2^{**}	$IOC_1 - IOC_2$	PROBABILITY VALUE
1	0.3166	0.3598	-0.0432	0.2039
2	0.4053	0.4383	-0.0338	0.3569
3	0.4848	0.4840	+0.0008	0.9148
4	0.2925	0.2504	-0.0421	0.2884
5	0.3796	0.4441	-0.0645	0.0851

*1 = new ranchers

**2 = old ranchers

Freeman's (1965) θ was calculated for the statements regarding public lands. As with the *IOC*, none of the statements were statistically significant and there was essentially no association between county of residence and attitudes regarding public lands. The results for Freeman's θ are presented in Table 17.

TABLE 17
FREEMAN'S MEASURE OF ASSOCIATION:
RANCHERS AND PUBLIC LANDS BY COUNTY

STATEMENT	TEST STATISTIC	TWO-SIDED PROBABILITY VALUE
1	+0.0354	0.5775
2	+0.0304	0.6457
3	+0.0374	0.5514
4	+0.0975	0.1333
5	+0.0592	0.2897

Ranchers by Length of Time in Ranching and Attitudes Regarding Public Lands

The analyses were repeated comparing new and old ranchers. The observed results for the five statements regarding public lands are provided below. For each statement, N_1 = the number of new ranchers and N_2 = the number of old ranchers.

- Public lands should be open for recreational uses with no conditions or limitations ($N_1 = 69$, $N_2 = 95$).

	-3	-2	-1	0	+1	+2	+3
New	32	11	7	9	2	2	6
Old	77	14	15	183	6	8	8

2. Public lands should be open for recreational uses with limitations
($N_1 = 69$, $N_2 = 95$).

	-3	-2	-1	0	+1	+2	+3
New	3	2	5	7	16	7	29
Old	5	1	6	8	26	25	24

3. Public lands should be closed for recreational uses
($N_1 = 70$, $N_2 = 96$).

	-3	-2	-1	0	+1	+2	+3
New	38	12	7	10	1	1	1
Old	44	11	21	14	2	1	3

4. Public lands should be primarily used as a wildlife habitat
($N_1 = 70$, $N_2 = 96$).

	-3	-2	-1	0	+1	+2	+3
New	25	10	6	9	7	6	7
Old	35	13	13	10	15	2	8

5. The public should have access to public land through private land
($N_1 = 70$, $N_2 = 99$).

	-3	-2	-1	0	+1	+2	+3
New	49	5	0	6	2	2	6
Old	66	9	6	6	4	4	4

For Table 18, the observed data for new ranchers indicates that consensus on the statements ranged between 22.16 percent for Statement 4, “Public lands should be primarily used as a wildlife habitat” and 54.24 percent for Statement 3 “Public lands should be closed for recreational uses.” Consensus among old ranchers ranged between 28.29 percent for Statement 4 and 48.38 percent for Statement 5, “The public should have access to public land through private land.” Differences ranged between 0.11 percent for Statement 1 and a high of 6.69 percent for Statement 3. Statements 2 and 5 resulted in statistically significant results, but have little substantive significance.

TABLE 18
INDEX OF ORDINAL CONSENSUS:
RANCHERS’ AND PUBLIC LANDS BY YEARS ON RANCH

STATEMENT	OBSERVED		DIFFERENCE	TWO-SIDED
	IOC_1^*	IOC_2^{**}	$IOC_1 - IOC_2$	PROBABILITY VALUE
1	0.3406	0.3418	-0.0011	0.2437
2	0.3922	0.4505	-0.0583	0.0020 [†]
3	0.5424	0.4756	+0.0669	0.0727
4	0.2216	0.2829	-0.0613	0.2044
5	0.4235	0.4838	-0.0603	0.0002 [†]

*1 = new ranchers

**2 = old ranchers

[†] indicates significance at a nominal $\alpha = 0.05$.

Somer’s (1962) d_{yx} measure of association was calculated for the statements regarding public lands. In terms of statistical significance, this exact measure of association indicates that there is no association between new and old ranchers and their opinions regarding public lands.

TABLE 19
SOMER'S d_{yx} MEASURE OF ASSOCIATION:
RANCHERS AND PUBLIC LANDS BY YEARS ON RANCH

STATEMENT	TEST STATISTIC	TWO-SIDED PROBABILITY VALUE
1	+0.0430	0.3124
2	-0.0740	0.2029
3	+0.1082	0.1016
4	-0.0384	0.3324
5	+0.0131	0.4324

The results from Table 19 demonstrate no association between length of time on the ranch and opinions regarding public lands.

This chapter provided a description of the respondents to the survey, and considered differences between respondents depending upon county of residence and length of time in ranching. Broadly, the blocks of statements considered tapped the respondents' attitudes, beliefs, and behaviors regarding ranching and the environment, provided a sense of how ranchers feel about their communities, and assessed attitudes about public lands and the results indicate that ranchers were similar in their beliefs, behaviors, and attitudes, regardless of their county of residence or length of time in ranching. The following chapter provides a discussion of the statistical analysis, discusses how the theory applies, and provides conclusions for this research.

CHAPTER FIVE

DISCUSSION

“When we try to pick out anything by itself, we find it hitched to everything else in the Universe” John Muir, 1911.

This work is a study of ranching, and in particular, the beliefs, behaviors, and attitudes of ranchers. This study is also a consideration of community, and how ranchers feel about their community. Questions of public lands and public land use, amenity development, and environmental issues were specifically developed out of a wide array of possible studies from the wealth of data available through the survey, *Ranching and Farming in Colorado; Understanding the Challenges Facing Landowners and Operators*. In addition, the data provided a general, demographic description of ranchers in Northwestern Colorado. This analysis, however, considers only a small portion of the possible analyses and leaves many options for future study.

The survey was sent to a complete enumeration of ranchers in the study area. The response rate however, was just over 50 percent and therefore it is possible that there was some systematic non-response bias. For example, one rancher indicated that since her or his property was in three states (Colorado, Utah, and Wyoming), he or she was not eligible for the study. Similar comments came from ranchers where the majority of their property was not in Colorado. In addition, ranchers who were outspoken in area newspapers regarding local land-use issues did not return surveys

even after multiple requests. Anecdotal evidence suggests that at least a small number of the non-respondents also had very large ranching properties. A 55 percent response rate does allow the researcher to draw conclusions about the data, however, and those conclusions follow.

If the ranchers who returned surveys are reflective of the characteristics of the general population of ranchers in the two counties, the population is approaching an age when people might consider retiring; the average age for respondents was 60.26 years and the median age was 61 years. Ranchers' ages could be a push factor regarding decisions about whether to continue to ranch or to sell the property. It is true, however, that ranchers usually work beyond the age of 65.

Most ranchers either raised livestock or had a mixed crop and livestock operation, but few ranchers relied solely on ranching for income. The majority of respondents indicated that only 10 percent of their total income derived from ranching activities although 54 of the 295 (16.6%) respondents to this question relied on the ranch for more than three-quarters of their total income. Interestingly, 41.02 percent of respondents indicated that ranching had become a smaller proportion of their overall income in the past decade, as opposed to 43.40 percent who stated it was about the same and 15.59 percent who had had that proportion increase.

These results suggest that more ranchers rely on supplemental income to maintain a viable ranching operation. This is important because as the age of the population increases, it potentially becomes more difficult to find alternatives for earning non-ranch income. Moreover, it makes it more difficult for the lone rancher to maintain a ranch. On the other hand, however, if the reasons for ranching are cultural,

social, and/or historical, the opportunity to make a living income off the ranch while still operating a ranch property may be attractive.

Respondents provided comments at the end of their surveys that address these issues (See Appendix 2 for a full listing of the comments). For example, respondents from Moffat County wrote:

We are going to become extinct as our children can not afford the price of land plus equipment to invest on their own, or even take over – the Ranch owner average age is becoming older each year.

Almost all farms and ranches in Moffat County require at least one member of the family to work in town just to provide health insurance for the rest of the family.

You cannot make a living by ranching. There has to be an income outside of the ranching to just survive and pay the increasing feed, fuel etc. bills.

We don't do it for the money but we need the money to keep doing it.

We are a dying breed.

The small or family farm's becoming a thing of the past. You can no longer survive without outside income.

And from Routt County,

We are at the age of the average farmer or rancher (56 + 57). We're looking for ways to slow down and get out of the snow. In good conscience, we could not allow a young couple to penalize themselves with such heavy debt for a lifestyle.

My husband passed away at age 60. We sold all our cattle in May and I am selling our interest in a farm in order to pay medical expenses. Each of my grown children are now holding down 2 jobs and have very little time to devote to the farm and ranch. I will try to hold on to our mountain pasture for now and buy cattle or lease for grazing but our family is probably on the way out of Ranching and Farming. My husband and I leased land and ran ahead of "development" for 30 years.

Ranchers in Routt Co. should be placed on the Endangered species list, even though it would not prevent their demise.

To sum it up: I am worth a \$million to someone who wants the prestige of owning a ranch but I can't buy lunch.

One gets the sense from the comments that the older ranchers lament the changes in ranching, and in particular, problems associated with low costs for the product but high costs for the tools of the trade. Interestingly, several of the 138 survey respondents who provided comments discussed involvement in CRP, the Conservation Reserve Program run by the USDA, as a way of supplementing ranch income. A few ranchers used CRP for income, but some opposed what they saw as government intervention.

We have just enough acreage to cost us but not enough to work it full time. Operating expenses have forced us to lease out hay production and rely on CRP to make the ranch viable.

Being in the CRP makes us different than full time operating ranch/farms.

No agricultural ranch/farm these days would exist w/out subsidies, CRP, etc.

I think that so much land being in CRP has affected us.

With the increase pressure from foreign markets and the CRP program I don't think this will ever be a grain producing area again.

CRP encourages landowners to leave land unused when they would otherwise lease it as pasture to local ranchers!

CRP is a voluntary program for agricultural landowners that provides rent payments and cost-share assistance and was developed to establish long-term, resource conserving covers on eligible farmland (Farm Service Agency, n.d.), i.e., crop land

than can be converted to grasslands. According to the Farm Service Agency, 16,801.5 acres in Moffat County and 33,401 acres in Routt County were protected under CRP.

RANCHERS' ATTITUDES TOWARDS ENVIRONMENTAL POLICY

Section B5 of the ranching survey (see Appendix 1 for the full survey) contained a series of eleven statements that asked ranchers to assess their attitudes regarding the environment. For this discussion, the three categories of disagreement; strongly disagree, disagree, and somewhat disagree, as well as the three categories of agreement; strongly agree, agree, and somewhat agree are collapsed into two categories; agree and disagree. The percentages do not add to 100 percent for these two categories, as individuals who indicated they were neutral regarding a statement are not included.

Within those eleven statements, the first three dealt with control over environmental policy. The results of the analysis indicated that ranchers prefer local control when it comes to environmental policy. The statement, "The U.S. government should have authority in achieving environmental policy" resulted in disagreement from 72.30 percent of Moffat County respondents and 69.39 percent of Routt County. Only 14.86 percent of Moffat County respondents and 21.09 percent of Routt County ranchers agreed with the statement. The difference in consensus for this statement was statistically significant at a nominal $\alpha = 0.05$. Support for local policy was stronger, 56.76 of Moffat County respondents and 56.85 percent of Routt County respondents agreed that local governments should have authority over environmental policy. Approximately one third of respondents disagreed with the statement, 31.08 percent in Moffat County and 33.56 percent in Routt County. From these results, it is

possible to conclude that there is consensus between and within counties for local control over environmental policy.

The preceding analysis tapped attitudes about control over environmental policy. Given the support for local control over governmental policy, an interesting follow-up to the question would be to see if respondents participated in local groups that deal with policies for the two counties. In other words, does the attitude that local control over environmental policy is preferable to state or national control translate into local involvement in government or other organizations?

The most direct way that a rancher could be involved in local policy would be through engagement in community government. Ranchers could also be involved more peripherally through involvement in civic organizations (e.g., the Rotary or Kiwanis Club) or through membership in an organization specifically for ranchers and farmers (e.g., the Farm Bureau or Cattleman's Association). Just under half of the respondents indicated they were involved in community government (47.94% were involved or somewhat involved, 44.27% in Moffat and 48.82% in Routt counties), and approximately one quarter (20.81%) of the respondents indicated they were involved in civic organizations, 25.95 percent in Moffat County and 29.60 percent in Routt County. Involvement in ranch organizations was the highest, with over half (62.99%) the respondents in both categories involved in these organizations 58.65 percent in Moffat County and 64.23 percent in Routt County. Thus, it appears that ranchers' attitudes regarding local control does translate into behavior.

Patterns for new versus old ranchers were similar, with significant differences in consensus between the counties for the national level environmental policy but most

respondents disagreeing with policy at the national level, and more support for local level environmental policy decisions. There was a 10.86 percent difference in consensus between New and Old ranchers for the statement regarding national level policy, which was statistically significant at a nominal $\alpha = 0.05$. For the first statement in the block, ranchers with at least 11 years on the ranch exhibited more consensus than the new ranchers. For New ranchers, 26.76 percent agreed that environmental policy should be decided by U.S. government with 60.56 disagreeing, compared to 21.43 percent agreement and 77.55 percent disagreement for Old ranchers, results that are similar to the county-by-county comparison.

Respondents were somewhat more supportive for state-level policy, with 43.66 percent of new ranchers agreeing that environmental policy should be decided by State government compared to 45.07 percent who disagreed; 34.69 percent of old ranchers agreed with state-level control while 59.18 were against state control over environmental policy. The greatest support was for locally-based environmental policy, with 60.56 percent of new ranchers and 57.14 percent of old ranchers agreeing with local level environmental control; 25.35 percent of new respondents and 35.71 percent of old respondents disagreed with local control over environmental policy.

As for involvement in community government, civic organizations, or ranching organizations, again, slightly less than half of the respondents indicated they were involved in community government; 48.44 percent of new ranchers and 45.68 percent of old ranchers, and approximately one quarter (21.88% of new ranchers and 20.49%) of the respondents indicated they were involved in civic organizations. As with the county-by-county comparisons, involvement in ranch organizations was the highest,

with 47.76 percent of new ranchers involved in ranching organizations and almost three quarters (73.86%) of old ranchers involved in these organizations.

RANCHERS' ATTITUDES TOWARDS ENVIRONMENTAL CHOICES

The next three statements in Section B5 were regarding conservation easements and working with local and national environmental groups. There was no difference in consensus on how respondents in the two counties felt about the use of conservation easements to achieve environmental policy and the responses were fairly evenly distributed among the seven ordered categories for Moffat County. Half of the respondents in Routt County agreed with the use of conservation easements to achieve environmental policy. Specifically, in Moffat County 31.97 percent of respondents disagreed with the statement and 34.69 percent agreed with the statement. In Routt County 26.53 percent disagreed and 49.66 percent agreed with the use of conservation easements for environmental policy. This analysis resulted in a difference of 7.95 percent, which was statistically significant at a nominal $\alpha = 0.05$.

Moffat County residents tended to disagree that local environmental groups were good to work with; 54.73 percent of Moffat County respondents disagreed while 18.92 percent agreed. In Routt County, 47.92 percent of the respondents disagreed that local environmental groups were good to work with, although 30.56 agreed. Views were more consistently negative regarding national environmental groups; 75.86 percent of Moffat County respondents disagreed and only 6.21 percent agreed. For Routt County, 68.97 percent disagreed and 15.86 percent agreed that national level environmental groups were good to work with. The difference in consensus of 10.28

percent was statistically significant at a nominal $\alpha = 0.05$. Measures of association were significant for the same two statements.

The final five questions in section B5 also tapped ranchers' opinions about the environment, including statements about ranching, environment, and profits; and whether environmental groups were knowledgeable about ranching and the environment. Ranchers were asked to state level of agreement with the statement, "Ranchers are more concerned about the environment than profitability." In Moffat County, 31.03 percent of respondents disagreed and 42.76 percent agreed, compared to 42.76 percent disagreement and 39.31 percent agreement for Routt County. For the statement "ranchers are good environmentalists," few Moffat County respondents disagreed with the statement (10.14 %) and most respondents agreed (84.46%). Similar results were reported for Routt County, few respondents disagreed with the statement (5.37%) and most respondents agreed (81.88%).

Respondents in the two counties disagreed that ranchers may have to hurt the environment to be profitable, 78.62 percent and 70.95 percent of respondents disagreed for Moffat and Routt counties, respectively. Conversely, 11.72 percent and 12.84 percent of respondents in Routt and Moffat counties agreed with the statement. Ranchers also strongly disagreed with the statement, "environmental groups are knowledgeable about ranching and its effect on the environment"; 92.52 percent of ranchers in Moffat County disagreed while only 4.76 percent agreed with the statement. Routt County ranchers followed a similar pattern with 85.23 percent disagreement while 9.40 percent agreed with the statement. The difference in consensus between the two counties, 19.27 percent, was significant at a nominal

$\alpha = 0.05$. Finally, the statement, “ranchers are more concerned about profits than the environment” resulted in 72.79 percent disagreement for Moffat County ranchers and 68.24 percent in Routt County. Agreement for the statement was low with 17.01 percent of ranchers in Moffat County agreeing while 18.24 percent of respondents in Routt County agreed with the statement.

These statements make it clear that ranchers, in general, feel that they are good environmentalists and that they do not have to hurt the environment to be profitable. Moreover, ranchers believe that they are misunderstood by environmental groups. As with the previous set of questions, these statements were designed to assess attitudes. A corresponding set of five behavioral questions were tested to compare the ranchers’ attitudes to their behaviors.

There are a variety of grazing management practices that have been suggested as “best practices” (NRCS, 2003) These practices include monitoring grazing resources, adjusting stocking rates according to changes in forage, using rotational grazing or some form of resting system, distributing water points evenly on active pasture, placing supplemental licks away from water points, and restricting livestock access to riparian areas. Respondents in both counties were asked to indicate whether they used any or all of these practices.

Most respondents in the two counties indicated they monitored grazing resources, with 83.16 percent in Moffat County and 78.69 percent in Routt County answering in the affirmative. Similar results were obtained when respondents were asked if they adjusted stocking rates to fit available forage, 85.11 percent and 77.69 percent for Moffat and Routt counties, respectively. Fewer respondents used

rotational grazing or another resting system, 69.77 percent in Moffat County and 73.40 percent in Routt County. A similar pattern resulted when respondents were asked if they provide relatively evenly distributed water points, with 66.51 percent and 75.27 percent in Moffat and Routt counties, respectively stating they use evenly distributed water points.

The number of respondents who placed supplemental licks away from water points was, 71.63 percent for Moffat County and 74.38 percent for Routt County. Restricting livestock access to riparian areas was the category with the lowest proportion of usage — this was the only category that resulted in fewer than half the respondents indicating they used the practice. It is worth noting, however, that restricting livestock to riparian areas is only one way to manage these areas. Here, 31.25 percent of respondents in Moffat County and 36.96 percent of Routt County respondents indicated they restrict access to riparian areas. Only differences in providing evenly distributed water points was statistically significant at a nominal $\alpha = 0.05$.

These results indicate that attitudes and behaviors were, once again, fairly consistent. Although only about one third of respondents indicated that they restricted livestock access to riparian areas, the rest of the categories were consistently well over half of respondents indicating they used the practice in their ranching operation.

The same statements were analyzed comparing new and old ranchers. For the three statements regarding conservation easements and working with local and national environmental groups, there was no statistically significant difference in consensus on how new and old respondents felt about the use of conservation

easements to achieve environmental policy. Among new ranchers, 25.35 percent disagreed that conservation easements were a means for achieving environmental policy and 50.74 percent agreed. Old ranchers exhibited slightly less agreement with the statement, 29.29 percent disagreed compared to 41.41 percent who agreed with the use of conservation easements for environmental policy.

About half (49.30%) of new residents disagreed that local environmental groups were good to work with, while 21.13 percent agreed. Among old ranchers, 52.63 percent of the respondents disagreed that local environmental groups were good to work with, although about one quarter (25.26%) agreed they were good to work with. Views were more consistently negative regarding working with national environmental groups; 68.57 percent of new ranchers disagreed and 12.86 percent agreed. For old ranchers, 71.88 percent disagreed and 9.38 percent agreed that national level environmental groups were good to work with. Although the difference in consensus of 6.16 percent was statistically significant at a nominal $\alpha = 0.05$, the substantive difference is questionable.

The final five questions in section B5 also tapped ranchers' opinions about the environment, including statements about ranching, environment, and profits; and whether environmental groups were knowledgeable about ranching and the environment. Ranchers were asked to state level of agreement with the statement, "Ranchers are more concerned about the environment than profitability." Among new ranchers, 40.00 percent of respondents disagreed with the statement and 32.86 percent agreed, compared to 39.18 percent disagreement and 43.30 percent consensus among old ranchers. For the statement "ranchers are good environmentalists," few new

ranchers disagreed with the statement (8.45 %) and most respondents agreed (84.51%). Similar results were reported for old ranchers, few respondents disagreed with the statement (8.08%) and most respondents agreed (81.82%). The difference in consensus for this statement was statistically significant at a nominal $\alpha = 0.05$, but the observed difference in consensus between new and old ranchers of 1.18 percent was not substantive.

Respondents in the two categories disagreed that ranchers may have to hurt the environment to be profitable, 78.87 percent and 69.70 percent of New and Old ranchers, respectively, disagreed with the statement. Conversely, 11.27 percent and 16.16 percent of respondents among new and old ranchers agreed with the statement. Respondents also strongly disagreed with the statement, "Environmental groups are knowledgeable about ranching and its effect on the environment"; 91.55 percent of new ranchers disagreed while only 4.23 percent agreed.

Old ranchers followed a similar pattern with 85.71 percent disagreement although 10.20 percent agreed with the statement. The difference in consensus between the two counties, 2.84 percent, was significant at a nominal $\alpha = 0.05$, which is not meaningful. Finally, the statement, "Ranchers are more concerned about profits than the environment" resulted in 72.86 percent disagreement for new ranchers and 68.69 percent among old ranchers. Agreement for the statement was low, 17.14 percent of new ranchers agreed with the statement and 21.21 percent of old ranchers agreed. Somer's (1962) d_{yx} measure of association was only significant for Statement 9, "For ranchers to be profitable they may have to hurt the environment."

These statements make it clear that ranchers, in general, feel that they are good environmentalists and that they do not have to hurt the environment to be profitable regardless of whether they are relatively new to the ranch, or have been on the property for a longer time. As with the county-by-county results, new and old ranchers believe that they are misunderstood by environmental groups.

Next, consider the questions regarding management practices for new and old ranchers. Most respondents in the two counties indicated they monitored grazing resources, with 82.00 percent of new ranchers and 79.50 percent of old ranchers answering in the affirmative. Similar results were obtained when respondents were asked if they adjusted stocking rates to fit available forage, with 75.51 percent and 82.05 percent for new and old ranchers, respectively. Responses were almost identical in their use of rotational grazing or another resting system, 71.43 percent of new ranchers and 71.79 percent of old ranchers utilized some type of resting system. Respondents were asked if they provide relatively evenly distributed water points, and 60.80 percent of new ranchers and 64.58 percent utilized this management practice.

The number of respondents who placed supplemental licks away from water was lower than what was observed in the county-by-county analysis, 66.93 percent of new respondents and 59.18 percent of old respondents used this practice. Restricting livestock access to riparian areas was once again the category with the lowest proportion of usage — this was the only category that resulted in fewer than half the respondents indicating they used the practice. Here, 28.57 percent of new ranchers and 27.03 percent of old ranchers indicated they restrict access to riparian areas.

These results indicate that attitudes and behaviors were, once again, fairly consistent. Although less than a third of respondents indicated that they restricted livestock access to riparian areas, the rest of the categories consistently indicated over half of respondents used the practice in their ranching operation.

RANCHERS AND THEIR COMMUNITY

Section B7 of the ranching survey asked about ranchers' attitudes about their community. The statements in the section asked respondents to indicate if they felt that making a living in ranching is more difficult than 10 years ago and if it was as enjoyable as it had been 10 years ago. Statements also assessed how changes in the population affected ranching, and followed up with questions on quality of life, friendliness, and relationships with neighbors. The final question asked whether respondents identified more with a region than a particular community.

Most of the respondents felt that making a living in ranching was more difficult now than ten years ago. Respondents in Moffat County overwhelmingly agreed that ranching was more difficult (85.03%), with only 6.22 percent of people disagreeing. In Routt County, the majority again agreed that making a living in ranching was more difficult than it was ten years earlier; 84.87 percent agreed versus 8.55 percent who disagreed.

The statement, "I enjoy ranching in Colorado as much now as I did 10 years ago" resulted in respondents more evenly distributed among the categories. Slightly more than a quarter of Moffat County residents (27.59%) disagreed with the statement while over half (56.55%) agreed. Routt County results were similar, 28.67 percent disagreed and 52.67 agreed.

The next three statements dealt specifically with population growth. The differences between the two counties were more disparate for these questions than for most of the other statements that were considered. For example, the results for “Population growth in my county threatens my ranching operation” resulted in almost a third (32.88%) of respondents in Moffat County disagreeing, compared to 47.47 percent who agreed with the statement. In Routt County, however, only 18.42 percent disagreed and fully two-thirds of Routt County residents agreed (67.11%). For the next statement, “Population growth pays its own way in my county,” 47.55 percent of Moffat County respondents disagreed compared to 16.08 percent who agreed with the statement. Results for Routt County showed 68.42 percent disagreement with the statement compared to 11.84 percent agreement. For the statement, “New residents have made my county a better place to live,” 55.86 percent of Moffat County residents disagreed and 13.79 percent agreed. In Routt County, 68.00 percent of respondents disagreed and 13.33 percent agreed.

The final set of questions in that block assessed quality of life issues such as friendliness and relationships with neighbors. In general, respondents indicated their county was a very good place to live, with only 4.83 percent of respondents in Moffat County disagreeing and 84.23 percent in agreement with the statement. More Routt County respondents disagreed, 11.33 percent and slightly fewer Routt County respondents agreed with the statement (80.67%). This statement was one of three in which the difference in consensus between the counties was statistically significant at a nominal $\alpha = 0.05$, with an observed difference in consensus of 9.53 percent. For this statement, the consensus was higher for Moffat County than for Routt County.

For the statement, “The quality of life in my county is good,” only 3.57 percent of Moffat County residents disagreed and 85.71 percent agreed. In Routt County, 8.00 percent of respondents disagreed compared to 84.67 percent agreement. The next statement, “Ranching is less important to my county’s quality of life than 10 years ago” resulted in sharp distinctions between the two counties. Almost 30 percent (29.17%) of respondents in Moffat County disagreed while 60.42 percent agreed, but in Routt County 22.88 percent of the respondents disagreed and 72.55 percent agreed with the statement. This statement was also a little unusual in that many of those in Routt County who agreed, strongly agreed (49.02%).

The next statement for which the difference in consensus was statistically significant was the following; “My county is a friendly place to live.” Here, 6.25 percent of Moffat County residents disagreed and 83.33 percent agreed with the statement. In Routt County, 12.67 percent disagreed and 76.67 percent agreed. The difference in consensus between the two counties was 11.58 percent and the greatest degree of consensus was, again, in Moffat County.

The last two statements were, “Ranchers generally have good relations with their non-ranching neighbors” and “I identify more with a region than a particular community (for example Steamboat or Craig).” The statement regarding non-ranching neighbors resulted in 21.68 percent of Moffat County respondents in disagreement while 67.13 percent agreed. In Routt County, 31.13 percent of respondents disagreed and only about half of the respondents agreed (49.67%). The difference in consensus between the two counties was not significant, and Routt County residents are less likely to indicate ranchers generally have good relations with their neighbors. The

final statement regarding whether ranchers related more to a region than a particular community resulted in 20.83 percent of Moffat County respondents disagreeing and 56.94 percent in agreement. For Routt County, on the other hand, 14.09 percent disagreed and 63.76 percent agreed with the statement. This result was also significant at a nominal $\alpha = 0.05$, with an observed difference of 9.82 percent. In this case, however, Routt County had the highest amount of consensus for the statement. Freeman's (1965) θ resulted in significant results for the third, fourth, eighth, and tenth statement in section B7, feelings about community.

As with the previous results, section B7 was also analyzed for differences by length of time in ranching. Most of the respondents felt that making a living in ranching was more difficult now than 10 years ago. New ranchers overwhelmingly agreed that ranching was more difficult (84.51%), with only 8.45 percent of respondents disagreeing. Among old ranchers, the majority agreed that making a living in ranching was more difficult; 84.16 percent agreed versus 6.93 percent who disagreed. It is also worth noting that 57.43 percent of old ranchers strongly agreed that making a living in ranching was more difficult now. This statement was one of five in which the difference in consensus between the new and old ranchers was statistically significant at a nominal $\alpha = 0.05$, although there is no substantive significance to the difference of 0.38 percent.

The statement, "I enjoy ranching in Colorado as much now as I did 10 years ago" resulted in respondents more evenly distributed among the categories. Slightly more than a quarter of new ranchers (25.71%) disagreed with the statement and a little

less than half (44.29%) agreed. Old ranchers were more likely to agree with the statement, although 29.29 percent disagreed, while 58.59 percent agreed.

The next three statements dealt specifically with population growth. The results for “Population growth in my county threatens my ranching operation” resulted in almost a third (30.99%) of new ranchers disagreeing, compared to 47.89 percent who agreed with the statement. For old ranchers, however, 24.00 percent disagreed and almost two-thirds of old ranchers agreed (62.00%). For the next statement, “Population growth pays its own way in my county,” 53.52 percent of new ranchers disagreed and only 19.72 percent agreed with the statement. Results for old ranchers was similar, 56 percent of old ranchers disagreed compared to 15.00 percent agreement for old ranchers. The statement, “New residents have made my county a better place to live,” resulted in 59.15 percent of new ranchers disagreeing and 15.49 percent agreeing, whereas 57.58 percent of old ranchers disagreed and 17.17 percent agreed.

The final set of questions in that block assessed quality of life issues such as friendliness and relationships with neighbors. In general respondents indicated their county was a very good place to live, with only 4.23 percent of new ranchers disagreeing and 87.32 percent in agreement with the statement. More old ranchers disagreed, 9.09 percent, and slightly fewer old ranchers agreed 83.84 percent. This statement was also statistically significant at a nominal $\alpha = 0.05$, with an observed difference in consensus of 7.32 percent. For this statement, the consensus was higher for new ranchers than for old ranchers.

For the statement, “The quality of life in my county is good,” only 2.90 percent of new ranchers disagreed and 91.30 percent agreed. For old ranchers, 7.07 percent of respondents disagreed compared to 85.86 percent agreement. As with the previous statement, the difference in consensus was statistically significant at a nominal $\alpha = 0.05$, with an observed difference in consensus of 10.49 percent. For this statement, the consensus was again higher for new ranchers than for old ranchers.

The next statement, “Ranching is less important to my county’s quality of life than 10 years ago” resulted in more disparate results. Almost one-third of new ranchers (32.86%) disagreed compared to 54.29 percent who agreed, but for old ranchers, 20.79 percent of the respondents disagreed and 73.27 percent agreed with the statement. The next two statements resulted in differences that were statistically significant at a nominal $\alpha = 0.05$. They were, “My county is a friendly place to live,” where 5.71 percent of new ranchers disagreed and 87.14 percent agreed with the statement. Among old ranchers, 8.00 percent disagreed and 85.00 percent agreed. The difference in consensus between the different lengths of time in ranching was 4.71 percent and the greatest degree of consensus was again among new ranchers.

The statement “Ranchers generally have good relations with their non-ranching neighbors” resulted in 24.29 percent of new ranchers in disagreement while 55.71 percent agreed. For old ranchers, 23.00 percent of respondents disagreed and 66.00 percent of respondents agreed. The difference in consensus between length of time in ranching was statistically significant at a nominal $\alpha = 0.05$, but was not substantively significant at 1.04 percent. The final statement, “I identify more with a region than a particular community (for example Steamboat or Craig),” resulted in 17.14 percent of

new ranchers disagreeing with 58.57 percent in agreement. For old ranchers, 21.43 percent disagreed and 55.10 percent agreed with the statement. Somer's (1962) d_{yx} resulted in significant association for the third and eight statements in section B7.

PUBLIC LAND

A large number of the respondents grazed cattle on their own property, and the overwhelming majority of ranchers provided at least 75 percent of the forage for their cattle from their own properties. Twenty-five percent of the respondents used their own, private land for 100 percent of the forage for their cattle. By way of comparison, 51.42 percent of respondents did not lease land for grazing from other private property owners, 57.80 percent responded that they did not have federal grazing leases, and 66.83 percent did not utilize State or public lands for grazing.

These results are contrary to the popular conception of ranching in the West. National attention to public lands grazing, and anti-grazing books, magazines, and websites spend considerable time and energy depicting the problems of grazing and urging members of the general public to oppose public lands grazing. The negative attention has been sufficient to force ranching groups to respond to criticisms by initiating policies that address their critics. One group, however, claims that this problem has been overstated. According to "Public Lands Grazing" (n.d.), only 22 percent of Western ranchers have federal lands grazing permits, a figure that is consistent with the data from Moffat and Routt Counties. Regardless of how much public land is used by ranchers, the public land question is an important aspect of ranching in the New West for a variety of reasons.

First, public perceptions partially inform policy decisions and these policies affect ranchers. Second, people with smaller ranch properties are more likely to need to supplemental forage from public lands, especially if they rely on ranching for a majority of their income (Rowe, Bartlett, and Swanson, 2001). Thus, changes in access to public lands could disproportionately affect small-scale ranchers. The public lands question is also important from the perspective of the general public. Access to public lands has been available by accessing roads between ranch properties and ranchers have historically provided access to public lands through their private property. According to some of the respondents in the survey, two factors are changing that access: First, large corporations are buying contiguous properties, creating one large property and closing access roads. Second, a few of the people using private property access have disrespected the property by leaving trash behind and gates opened, resulting in ranchers hesitating to provide access.

We do allow most people in the area Free use of our property for fishing and some hunting. But it is never enough they trespass and destroy our property.

Ranchers are facing a lot of major hurdles, antigrazing on public land is only one of them

Our family is leasing our private land for grazing. This is best use that we can put it to as we are unable to run an economic viable ranch operation. Because we have private land, the push to eliminate public grazing helps us. We still strongly support public grazing, however.

The other problem – two large corporations are buying up ranches wherever available for a 100 miles or more and making empires. They are closing their borders to public use.

The amount of investment in time and money to maintain this lifestyle in Routt County is incredible. The public wants to view and drive thru this atmosphere, but they don't want to help support it.

Aside from anecdotal discussion about public lands and ranching, the survey asked ranchers to respond to five questions regarding how they felt public lands should be used. There was a considerable amount of consensus on all five statements, both between and within counties. The three levels of disagreement, strongly disagree, somewhat disagree, and disagree were collapsed into a single, “disagree” category for the following consideration, and strongly agree, agree, and somewhat disagree were collapsed into a single “agree” category.

Ranchers overwhelmingly disagreed that public lands should be open to recreation with no conditions or limitations: overall 73.87 percent of respondents disagreed with the statement. On the other hand, however, most ranchers agreed that public lands should be open for recreational use with limitations, 80.14 percent overall. Similar results were obtained for the statement regarding closing public lands to recreational use, 80.23 percent overall. Not surprisingly, ranchers overwhelmingly rejected the statement that the public should have access to public land through private land, with 200 of 305 (65.57%) respondents strongly disagreeing with the statement. The collapsed category resulted in 77.63 percent of respondents in the two counties who disagreed.

People feel very strongly about public lands, that is why this uniquely western dynamic is so important. Ranchers who do utilize public lands for grazing rely on it for forage and further argue that grazing provides an environmental service by keeping noxious weeds in check on the public land, which also inhibits the spread of noxious

weeds to nearby private lands. Many environmental groups, however, argue that overgrazing public lands has resulted in erosion and a loss of plant and animal diversity on the land. The apparent impasse has long been a point of contention between ranchers and environmentalists and this is especially true for the latter part of the 20th Century.

During the research process for this paper, however, a new dynamic in the public lands debate began developing. Although it was not manifestly a part of this study, it is worth mentioning here, as it will likely become an important aspect in future discussions and research on public lands and ranching. A third party, recreationalists, has become an important factor in public lands discussions. It is possible, in fact, that the perceived problems of recreationalists' use of public lands will push ranchers and environmentalists together into what could be an uneasy alliance against some recreational land uses.

As noted previously, ranchers have had problems with members of the public accessing public lands through ranch properties and leaving trash behind and leaving gates open. Environmentalists have become increasingly agitated about the use of off road vehicles on public lands, from dirt bikes, jeeps, and snowmobiles, to the relatively new "All-Terrain Vehicles." Some environmental groups have begun to call for restrictions on the use of off-road vehicles, with one of the most visible conflicts coming over snowmobiles in Yellowstone National Park. Ranchers' complaints regarding off-road vehicles include destruction of habitat as well as the fact that some recreationalists have used the vehicles to stampede cattle. It is very interesting that this

conflict may be providing a mechanism to align environmentalists and ranchers on at least this one issue.

Moreover, much of cleavage between these two groups seems to come from a lack of understanding and a lack of communication about the facts on both sides of the issue. Game theory posits that actors behave in a manner that is individually rational in the absence of communication. Thus, it could be that if environmentalists and ranchers do come to the same table to discuss one issue, they could find resolution on other issues that still separate them.

CHAPTER SIX

CONCLUSION

Even though I have been farming and ranching 50 years with high input costs and comparatively low prices despite a farm program that isn't working at high expense to the tax payer. The past 4 or 5 years have been very depressing. I am concerned about passing a good agriculture unit down to the next generation that won't cash flow in the present economy.

To sum it up: I am worth a \$million to someone who wants the prestige of owning a ranch but I can't buy lunch. Respondent 515

The bridge between environmental sociology and the sociology of natural resources for this discussion is amenity development. Pulling together a combination of the theory of reasoned action and exchange theory provides a context for discussing ranchers' attitudes and their behaviors. For this portion of the dissertation, the question is whether ranchers' attitudes and behaviors match, or whether there is a disconnect that can be explained through the combination of reasoned action and exchange theory.

Ranchers' attitudes regarding environmental policy matched their behaviors to some extent when measured by involvement in local politics. The theory suggests that behaviors and attitudes will match when ranchers feel they have control over the situation and there is the potential for a positive outcome. Exchange theory provides additional explanation, through the social context of exchange as a loosely defined systems of costs and benefits, where the benefits may be such intangible items as

friendship, prestige, or future benefits not yet recognized. By engaging in local government and civic organizations, ranchers are behaving in ways that are consistent with their attitudes regarding local control over environmental policy.

New ranchers are somewhat less involved in ranching organizations and like the previous results; there is little trust for national level policy. Overall, however, there is evidence that ranchers, whether considered in county-by-county analyses or by length of time in ranching, are engaging in the process that allows them voice in political decisions.

Ranchers consistently indicated that they are good environmentalists and that ranchers do not need to harm the environment to be profitable. Comments from the survey suggest that problems with profit in ranching stem from a variety of factors including land prices and availability, costs for production materials, and stagnant prices for their product whether it be hay or beef. Some of the comments are provided below:

The land costs are too high. If the "true" ranchers want to run livestock – go to NB, or OKLA, N TX where land is cheap and production cost is low.

We are impacted big time because of the value put on the land through big Money sales. No way can you pay \$10,000 an acre for agriculture use.

Increased property taxes, high cost of equipment, equipment maintenance, increased costs of livestock care make ranching life impossible. Net profit gets smaller + smaller. The general public is not willing to pay higher prices for our products.

Ranching is and has been for a long time a way to live/occupy your time while the land increases in value. You can make a marginal profit but it's really a form of land speculation. And a way of life.

Interestingly, all those respondents who included comments regarding high land costs were from the amenity growth county.

As with the policy statements, ranchers' behaviors regarding grazing management practices were also considered in light of their attitudes concerning the environmental ethic of ranchers. Again, many of the ranchers participated in best management practices, especially in terms of monitoring grazing resources, adjusting stocking rates, and using either rotational grazing or similar system. Three-quarters (75.27%) of the respondents in Moffat County provided relatively evenly distributed water points as compared to about 60 percent for Routt County. An interesting follow-up question to this result would be to determine if the different environmental conditions in the two counties factor into the use of evenly distributed water points, or even force some of the decisions.

The last of the management practices, restricting livestock access to riparian areas is probably the most interesting result. Many of the pictures used by anti-grazing activists on websites and in books are pictures of damaged riparian areas. Perhaps as a result, this issue has received considerable attention and it is likely one of the ranching "issues" that people in the general public are the most familiar with. It is therefore interesting that the fewest number of ranchers restricted livestock access to riparian areas. Again, the reasons for why ranchers use, or do not use restricted access are beyond the scope of this project, but it is certainly a point that would provide provocative study in future research. In general, however, it appears that ranchers' attitudes and behaviors are fairly consistent as measured by the attitudinal and behavioral questions.

Understanding the beliefs, behaviors, and attitudes of ranchers through the lens of exchange theory may help to explain what appears to be a high level of consistency between the attitude and belief, and the behavior. Ranchers tend to be both highly social and highly individual. Ranchers rely on neighbors sometimes miles away for a variety of types of assistance, from help with building new structures to tackling the large jobs that occur on all ranches. Branding, for example, typically involves neighbors and friends who spend hours either cooking or attending to the calves, providing inoculations, tags, brands, or sometimes, just hands and a rope. Deeply imbedded in this tradition is social capital that ranchers rely on for their existence. Thus, the exchange of actions for a good reputation may be a strong force in guiding behaviors on the ranch. Perhaps the costs of not operating as a good steward on the land are high from an exchange perspective, but are also factors that enter into the theory of reasoned behavior, i.e., control over the situation and the potential for a positive outcome.

The assessment of feelings of community resulted in some interesting findings. Not surprisingly, the prices of land in the amenity-growth county emerged as a point of departure for ranchers in the two counties. In addition, respondents in Routt County were more likely to be negative regarding their relationships with non-ranching neighbors and felt that population growth was affecting their ability to run a viable ranching operation. Differences on consensus for statements within the community block were more pronounced than any other intercounty differences in this analysis.

In general, ranchers in Routt County agreed their county was a very good place to live and indicated that their quality of life was good, which was also true of respondents in Moffat County. The differences in the two groups really manifested when ranchers replied to questions on population growth, whether new residents made the county a better place to live and in particular, the effect that changes in the county had on how important they perceived ranching to be in the overall structure of the community. It is interesting that a large portion of Routt County respondents strongly agreed that ranching was now less important when placed in the context of the travel survey discussed earlier. Recall, researchers attributed over \$7 million in revenues from tourists, many of whom traveled to the area because of the presence of ranches in the community. Again, almost half of the respondents to the travel survey indicated that the ranches were the one aspect of travel that made Routt County unique, and if the ranches were developed almost half of the respondents indicated they would go to an alternative travel destination (Environment Colorado, 2006).

These results indicate that amenity development has affected the way ranchers in Routt County feel about their community and lifestyle, and the evidence suggests that it is more difficult to maintain the same life in Routt County that was available historically. Similar challenges are somewhat reflected in Moffat County, although the respondents have fewer pressures from population changes and are more likely to experience problems resulting from a relatively depressed economic condition in the county.

The differences regarding aspects of community between the new ranchers and old ranchers also provided some interesting results. For example, almost 60 percent of

new residents, i.e., those who had owned their property for ten years or less, disagreed with the statement, “New residents have made my county a better place to live,” and somewhat surprisingly only a little more than 15 percent agreed. In general, the differences between new and old ranchers were quite similar to those observed between the two counties. Future research could develop those differences and similarities. Alternative explanations include the potential that a portion of the “new” ranchers were new to the property but not new to ranching and this affected the results. In addition, it is possible that new ranchers had adopted cultural and behavioral aspects of the ranch lifestyle as part of an attitude they had prior to owning the property, and thus, their attitudes were similar to those already in ranching.

This research began with a series of null hypotheses that were intended to tap ranchers’ beliefs, behaviors, and attitudes regarding ranching:

- no differences in attitudes between respondents in Moffat and Routt counties regarding public land use,
- no differences in attitudes between “new” and “old” ranchers regarding public land use,
- no differences in attitudes between respondents in Moffat and Routt counties regarding attitudes about the environment,
- no differences in attitudes between “new” and “old” ranchers regarding attitudes about the environment,
- no differences in attitudes between respondents in Moffat and Routt counties regarding how respondents feel about their community,

and

- no differences in attitudes between “new” and “old” ranchers regarding how respondents feel about their community.

The findings resulted in few differences between respondents regarding public land use, whether the comparison was between the two counties or between new and old ranchers. There were also few attitudinal differences between respondents in Moffat and Routt counties regarding attitudes about the environment, and few substantive differences between new and old ranchers. Surprisingly, respondents in Moffat and Routt counties were also similar in their responses to the new and old ranchers regarding their communities. Ranchers overwhelmingly indicated they enjoy ranching although they acknowledged that ranching was more difficult now than it had been in the past.

One surprising result was the relatively small effect the public land dynamic had on ranchers in Northwestern Colorado. Newspaper articles from the study area indicated that there was considerable debate taking place during the study period dealing with issues such as who does, or should, have access to public lands and perhaps more importantly, *how* people access public lands. These articles included discussions regarding whether private land owners should be *expected* to provide access. Additional topics included restricting cattle on public lands, and one article discussed a lawsuit filed by an Idaho-based environmental group to block the renewal of grazing leases on 377,000 acres of public land in the study area (Rocky Mountain News, 2002).

Given the press coverage and the level of contention about public lands, it is somewhat surprising that the public land issues were not more important in this study. This does raise a question about some of the error introduced through non-response. Although eligibility for the survey was based on whether a rancher owned *or operated*

a ranch property of at least 100 acres, respondents were overwhelmingly owners (293 of 320 respondents indicated they had an ownership interest in the ranch). It is possible that the wording made it more likely that owners of property responded to the survey and that people who relied more on grazing leases for ranching did not respond. Whatever the reason, the public land dynamic is one aspect of this research that may not represent ranching in general.

The question posed at the beginning of this study was whether ranching was passé. The answer to that depends on how one interprets the question. Ranching is part of American heritage. The continued popularity of rodeos, cowboy poetry, and western art and artifacts speaks to the continued interest in ranching as a cultural phenomenon. Another argument for preserving ranches beyond the tourist dollar is because an intact ranch property provides a continuous, undeveloped space for wildlife and plants.

In addition, comments at the end of the survey discussed the importance of providing a safe food product to not only individuals in Colorado, but to markets throughout the world. In terms of production relative to other areas, however, it is likely that if there was no ranching in Routt and Moffat counties, there would likely be no impact on the market. As with all sociology, the question comes down to the differences between the individual and the structure. Ranching matters to the individuals who engage in it, and they feel very strongly about ranching as a lifestyle and for what they provide in terms of a product and maintaining the western heritage.

To end ranching in the West would simply move associated environmental problems to areas and countries less likely to have mechanisms in place to handle the

problems. As evident in the ranchers' responses to the ranching survey, ranchers do more than consider themselves to be good stewards of the land; they act in ways that are consistent with that belief. In addition, ranching may be a way to halt exurban development. Ranching may also be seen as protecting an institution that is rapidly becoming a primary industry in many areas, especially high amenity areas; that is, tourism.

Ranching has had problems with overgrazing and abusing the land, but many of those in ranching have responded to the criticisms by adopting good land management practices. There was a time in the United States when most people acted in ways that were inconsistent with the current environmental beliefs, and problems with air, water, and ground pollution permeated the country, especially in urban areas. It was not until people became aware of the problems of pollution that people began to change their behavior, both through policy decisions and through education. As a result, people now consider themselves to be better stewards of the land. The American public owes ranchers the same chance. The evidence supports the idea that ranchers are good environmentalists and it is therefore unfair to focus on historic abuses or to stereotype based on egregious cases. In addition, ranchers should be provided voice in policy decisions that affect their ability to operate.

In many ways, ranching personifies the West by capturing the past while contributing to the future. Closing the door on this resource would have consequences far beyond the families immediately affected, and it is a cost that people in the United States cannot afford.

REFERENCES

- ADAM, BARBARA. 1998. "Re-vision: The Centrality of Time for and Ecological Social Science Perspective." In S. Lash, B. Szerszynski, and B. Wynne, (Eds.), *Risk, Environment, and Modernity: Towards a New Ecology* (pp. 84–103). London: Sage Publications.
- AJZEN, ICEK. 1991. "The theory of planned behavior." *Organizational Behavior and Human Decision Processes*, 50:179–211.
- AJZEN, ICEK. 2001. "Nature and Operation of Attitudes." *Annual Review of Psychology*, 52:27–58.
- AJZEN, ICEK AND MARTIN FISHBEIN. 1977. "Attitude-Behavior Relations – Theoretical–Analysis and Review of Empirical–Research." *Psychological Bulletin*, 84: 888-918.
- ANSWERS.COM. 2005. Magnetic Core Memory, Core Storage. [Online]. Available <http://www.answers.com/topic/magnetic-core-memory>.
- ASSOCIATED PRESS. 2001, April 29. Some Farmers Calling it Quits. *Steamboat Pilot & Today*, p. 8.
- ASSOCIATED PRESS. 2002a, June 10. Cattle Grazing Reduction Sought as Drought Worsens. *Craig Daily Press*, p. 7.
- ASSOCIATED PRESS. 2002b, August 7. Wisconsin Farmers Provide Hay Relief to Drought-Stricken Colorado. *Craig Daily Press*, p. 8.
- ASSOCIATED PRESS. 2002c, September 16. Colorado ranchers, farmers say drought threatens heritage. *Craig Daily Press*, p. 6.
- AXELROD, ROBERT M. 1984. *The Evolution of Cooperation*, New York: Basic Books.
- BACON, SUSAN. 2002, July 1. Grasshoppers Infesting Fields in Routt, Moffat Counties. *Craig Daily Press*, p. 6.
- BAKEMAN, ROGER, BYRON F. ROBINSON, AND VICENÇ QUERA. 1996. "Testing Sequential Association: Estimating Exact *P* Values Using Sampled Permutations." *Psychological Methods*, 1, 4–15.

- BEALE, CALVIN L. AND KENNETH M. JOHNSON. 1998. "The Identification of Recreational Counties in Nonmetropolitan Areas of the USA." *Population Research and Policy Review*, 17: 37–53.
- BECK, ULRICH. 1998. "Risk Society and the Provident State." In S. Lash, B. Szerszynski, and B. Wynne, (Eds.), *Risk, Environment, and Modernity: Towards a New Ecology* (pp. 27–43). London: Sage Publications.
- BELLIS, MARY. 2005. "Inventors of the Modern Computer. The History of the Integrated Circuit (IC) – Jack Kilby and Robert Noyce." [Online]. Available <http://www/inventors.about.com/library/weekly/aa080498.htm>.
- BELSKY, JILL M. 2002. "Beyond the Natural Resource and Environmental Sociology Divide: Insights from a Transdisciplinary Perspective." *Society and Natural Resources*, 15:269–280.
- BENTON, ALVA H. 1918. "Farm Tenancy and Leases." St. Paul, MN: University of Minnesota Agricultural Experiment Station Bulletin No. 150.
- BERGMANN, REINHARD, JOHN LUDBOROOK, AND WILL P. J. M. SPOOREN. 2000. "Different Outcomes of the Wilcoxon-Mann-Whitney Test from Different Statistics Packages." *American Statistician*, 54, 72–77.
- BERRY, KENNETH J. 1982. "Algorithm AS 179: Enumeration of All Permutations of Multi-sets with Fixed Repetition Numbers." *Applied Statistics, Journal of the Royal Statistical Society, Series C*, 31, 169–173.
- BERRY, KENNETH J. 2006a. Personal Communication. "Algorithm AS 179."
- BERRY, KENNETH J. 2006b. Personal Communication. "Relationship between Freeman's θ and Somer's d ."
- BERRY, KENNETH J., JANIS E. JOHNSTON, AND PAUL W. MIELKE, JR. 2004. "Exact Goodness-of-Fit Tests for Unordered Equiprobable Categories." *Perceptual and Motor Skills*, 98, 909–919.
- BERRY, KENNETH J., JANIS E. JOHNSTON, AND PAUL W. MIELKE, JR. 2005. "Resampling Probability Values for Measures of Ordinal Variation and Consensus." *Psychological Reports*, 96, 547–552.
- BERRY, KENNETH J., JANIS E. JOHNSTON, AND PAUL W. MIELKE, JR. 2006. "Exact and Resampling Probability Values for Measures Associated with Ordered R by C Contingency Tables." *Psychological Reports*, to appear.

- BERRY, KENNETH J. AND PAUL W. MIELKE, JR. 1985. "Subroutines for Computing Exact Chi-Square and Fisher's Exact Probability Tests." *Educational and Psychological Measurement*, 45, 153–159.
- BERRY, KENNETH J. AND PAUL W. MIELKE, JR. 1992a. "A Family of Multivariate measures of Association for Nominal Independent Variables." *Educational and Psychological Measurement*, 52, 41–55.
- BERRY, KENNETH J. AND PAUL W. MIELKE, JR. 1992b. "A Measure of Association for Nominal Independent Variables." *Educational and Psychological Measurement*, 52, 895–898.
- BERRY, KENNETH J. AND PAUL W. MIELKE, JR. 1992c. "Assessment of Variation in Ordinal Data." *Perceptual and Motor Skills*, 74, 63–66.
- BERRY, KENNETH J. AND PAUL W. MIELKE, JR. 1992d. "Indices of Ordinal Variation." *Perceptual and Motor Skills*, 74, 576–578.
- BERRY, KENNETH J. AND PAUL W. MIELKE, JR. 2000. "Exact and Monte Carlo Resampling Procedures for the Wilcoxon-Mann-Whitney and Kruskal-Wallis Tests." *Perceptual and Motor Skills*, 91, 749–754.
- BERRY, KENNETH J., PAUL W. MIELKE, JR., AND HOWARD W. MIELKE. 2002. "The Fisher-Pitman permutation test: An attractive alternative to the *F* test." *Psychological Reports*, 90: 495–502.
- BLANK, STEVEN C. 1998. *The End of Agriculture in the American Portfolio*. Westport Connecticut: Quorum Books.
- BLANK, STEVEN C. 1999. "The End of the American Farm." *The Futurist*, 33: 22–27.
- BLM Facts, Bureau of Land Management. [Online]. Available <http://www.blm.gov/nhp/facts/acres.htm>.
- BONANNO, ALESSANDRO, LAWRENCE BUSCH, WILLIAM H. FRIEDLAND, LOURDES GOUVEIA, AND ENZO MINGIONE. 1994. *From Columbus to ConAgra: The Globalization of Agriculture and Food*. Lawrence: University Press of Kansas.
- BOVEE, KIRSTEN. 2001. "Zero Cow Initiative Splits Sierra Club." *High Country News*, [Online]. Available http://www.hcn.org/servlets/hcn.Article?article_id=10281.
- BRAIN, MARSHALL. 2005. "How Bits and Bytes Work" in howstuffworks. [Online]. Available <http://computer.howstuffworks.com/bytes.htm>.

- BREHM, JOAN M., BRIAN W. EISENHAUER, AND RICHARD S. KRANNICH. 2004. Dimensions of Community Attachment and Their Relationship to Well-Being in the Amenity-Rich Rural West." *Rural Sociology*, 69:405–429.
- BROWN, DAVID L. 2002. "Migration and Community: Social Networks in a Multilevel World." *Rural Sociology*, 67:1–23.
- BROWN, KELLI MCCORMACK. 1999. "Theory of Reasoned Action/Theory of Planned Behavior." [Online]. Available http://hsc.usf.edu/~kmbrown/TRA_TPB.htm.
- BURGESS, JEFF. 2000. "The Public Lands Grazing Activist." [Online]. Available <http://www.jdburgessonline.com/grazing/index.html>.
- BUTTEL, FREDERICK H. 1987. "New Directions in Environmental Sociology." *Annual Reviews of Sociology*, 13:465–488.
- BUTTEL, FREDERICK H. 1992. "Environmentalization: Origins, Processes, and Implications for Rural Social Change." *Rural Sociology*, 57:1–27.
- BUTTEL, FREDERICK H. 1996. "Environmental and Resource Sociology: Theoretical Issues and Opportunities for Synthesis." *Rural Sociology*, 61:56–76.
- BUTTEL, FREDERICK H. 2002. "Environmental Sociology and the Sociology of Natural Resources: Institutional Histories and Intellectual Legacies." *Society and Natural Resources*, 15:205–211.
- BUTTEL, FREDERICK H., OLAF F. LARSON, AND GILBERT W. GILLESPIE, JR. 1990. *The Sociology of Agriculture*. Greenwood Press: Westport, CT.
- BUTTEL, FREDERICK H. AND HOWARD NEWBY. 1980. *The Rural Sociology of Advanced Societies*. Greenwood Press: Westport, CT.
- CARLSON, BOB, ANGELA BURGESS, AND CHRISTINE MILLER. n.d. *Timeline of Computing History* [Online]. Available <http://www.computer.org/computer/timeline/timeline.pdf>.
- CAROLAN, MICHAEL S. 2005. "Society, Biology, and Ecology: Bringing Nature Back into Sociology's Disciplinary Narrative through Critical Realism." *Organization and Environment*, 18:393–421.
- CARSON, RACHEL. 1962. *Silent Spring*. Boston: Houghton–Mifflin.
- CATTON, WILLIAM R. JR. AND RILEY E. DUNLAP. 1978. "Environmental Sociology: A New Paradigm." *The American Sociologist*, 13:41–49.

- "CHANGE THEORIES. REASONED ACTION." 2003. *The Communication Initiative*. [Online]. Available <http://www.comminit.com/changetheories/ctheories/changetheories-46.html>.
- CHAFEL, JUDITH A. AND CARIN NEITZEL. 2005. "Young Children's Ideas About the Nature, Causes, Justification, and Alleviation of Poverty." *Early Childhood Research Quarterly*, 20:433-450.
- CHARLES BABBAGE INSTITUTE. 2004. "Exhibits: Who was Charles Babbage?" [Online]. Available <http://www.cbi.umn.edu/exhibits/cb.html>.
- CHIOTTI, QUENTIN P. AND TOM JOHNSTON. 1995. "Extending the Boundaries of Climate Change Research: A Discussion on Agriculture." *Journal of Rural Studies*, 11:335-350.
- CLARK, BRETT AND RICHARD YORK. 2005. "Carbon Metabolism: Global Capitalism, Climate Change, and The Biospheric Rift." *Theory and Society*, 34:391-428.
- CLOCK SPEEDS. 2005. [Online]. Available <http://www.beens.org/grassroots/ClockSpeed.htm>.
- COMPETITIVE INTELLIGENCE (MOORE'S LAW). 2005. [Online]. Available <http://www.aurorawdc.com/ci/000317.html>.
- COMPUTER HISTORY: HISTORY FROM B.C. TO TODAY. 2005. [Online]. Available <http://www.computerhope.com/history>.
- COMSTOCK, JEFF. 2006. "Land Use Plan, Moffat County Colorado." Personal correspondence. Jeff Comstock, Director, Moffat County Natural Resources Department. Land Use Plan report from 2001.
- COOK, PEGGY J. 2000. "Food Stamp and Family Assistance Benefits Sharply Decline in the Post-Welfare-Reform Era." *Rural Conditions and Trends*, 11:68-74.
- CORE MEMORY. 2005. [Online]. Available <http://www.psych.usyd.edu.au/pdp-11/core.html>.
- CORNFIELD, JEROME. 1944. "On Samples from Finite Populations." *Journal of the American Statistical Association*, 39:236-239.
- CROWL, DOUG. 2002, August 30. Hay Auction Connects Cattlemen with Forage. *Craig Daily Press*, p. 3.
- CYTEL CORPORATION. 1987. "About Cytel." [Online]. Available <http://www.cytel.com/Corporate/default.asp>.

- D'ADDEZIO RECORDS ROOM. 2005. "Vital Records Search and Information Directory for the United States." [Online]. Available <http://www.daddezio.com/records/room/RR-CO-007.html>.
- DAVENPORT, MAE A. AND DOROTHY H. ANDERSON. 2005. "Getting From Sense of Place to Place-Based Management: An Interpretive Investigation of Place Meanings and Perceptions of Landscape Change." *Society and Natural Resources*, 18:625–641.
- DILLMAN, DON A. 1978. *Mail and Telephone Surveys: The Total Design Method*. New York: John Wiley.
- DILLMAN, DON A. 2000. *Mail and Internet Surveys: The Tailored Design Method*, 2nd Ed. New York: John Wiley.
- DONAHUE, DEBRA. 1999. *The Western Range Revisited : Removing Livestock From Public Lands to Conserve Native Biodiversity*. Norman, OK: University of Oklahoma Press.
- DUNLAP, RILEY E. AND WILLIAM R. CATTON, JR. 1979. "Environmental Sociology." *Annual Reviews of Sociology*, 5:243–273.
- DUNLAP, RILEY E. AND WILLIAM R. CATTON, JR. 2002. "Which Function(s) of the Environment Do We Study? A Comparison of Environmental and Natural Resource Sociology." *Society and Natural Resources*, 15:239–249.
- ECONOMIC RESEARCH SERVICE. United States Department of Agriculture. 2002. "Nonmetro Farming Communities." [Online]. Available <http://www.ers.usda.gov/briefing/Rurality/Typology/farming.htm>.
- ECONOMIC RESEARCH SERVICE. United States Department of Agriculture. 2004a. "Natural Amenities." [Online]. Available <http://www.ers.usda.gov/Data/NaturalAmenities/Map.htm>.
- ECONOMIC RESEARCH SERVICE. United States Department of Agriculture. 2004b. "Nonmetro Federal Lands Counties." [Online]. Available <http://www.ers.usda.gov/Briefing/Rurality/Typology/Fedlands.htm>.
- EDEN, T. AND F. YATES. 1933. "On the Validity of Fisher's Z Test When Applied to an Actual Example of Non-normal Data." *Journal of Agricultural Science*, 23, 6–16.

- EDER, KLAUS. 1998. "The Institutionalisation of Environmentalism: Ecological Discourse and the Second Transformation of the Public Sphere." In S. Lash, B. Szerszynski, and B. Wynne, (Eds.), *Risk, Environment, and Modernity: Towards a New Ecology* (pp. 203–223). London: Sage Publications.
- EDGINGTON, EUGENE. S. 1995. *Randomization Tests*, 3rd Ed. New York: Marcel Dekker.
- ELDER, GLEN H., JR., ELIZABETH B. ROBERTSON, AND E. MICHAEL FOSTER. 1994. "Survival, Loss, and Adaptation: A Perspective on Farm Families." In R. D. Conger and G. H. Elder, Jr., (Eds.), *Families in Troubled Times: Adapting to Change in Rural America* (pp. 105–126). New York: Aldine de Gruyter.
- ENVIRONMENT COLORADO. 2006. "Losing Ground: Colorado's Vanishing Agricultural Landscape." Environment Colorado Research And Policy Center, (March).
- EPODUNK: THE POWER OF PLACE. 2006. "Colorado Counties." [Online]. Available http://www.epodunk.com/counties/co_county.html.
- FARM SERVICE AGENCY. n.d. "Conservation Reserve Program." [Online]. Available <http://www.fsa.usda.gov/dafp/cepd/crp.htm>.
- FIELD, DONALD R., A. E. LULOFF, AND RICHARD S. KRANNICH. 2002. "Revisiting the Origins of and Distinctions Between Natural Resource Sociology and Environmental Sociology." *Society and Natural Resources*, 15:213–227.
- FISHBEIN, MARTIN. 1961. "An Investigation of the Relationships between Beliefs about an Object and the Attitude toward that Object." University of California, Los Angeles. Technical Report No. 6, Contract Nonr-233 (54).
- FISHBEIN, MARTIN. 1963. "An Investigation of the Relationships between Beliefs about an Object and the Attitude toward that Object." *Human Relations*, 16:233–239.
- FISHBEIN, MARTIN. 1967a. "A Consideration of Beliefs, and Their Role in Attitude Measurement." In M. Fishbein (Ed.), *Attitude Theory and Measurement* (pp. 257–266). New York: John Wiley & Sons.
- FISHBEIN, MARTIN. 1967b. "A Behavior Theory Approach to the Relations between Beliefs about an Object and the Attitude toward the Object." In M. Fishbein (Ed.), *Attitude Theory and Measurement* (pp. 389–400). New York: John Wiley & Sons.

- FISHER, RONALD A. 1925. *Statistical Methods for Research Workers*. Edinburgh: Oliver and Boyd.
- FISHER, RONALD A. 1935a. *The Design of Experiments*. Edinburgh: Oliver and Boyd.
- FISHER, RONALD A. 1935b. "The Logic of Inductive Inference." *Journal of the Royal Statistical Society*, 98, 39–82.
- FISHER, RONALD A. 1936. "'The Coefficient of Racial Likeness' and the Future of Craniometry." *Journal of the Royal Anthropological Institute*, 66, 57–63.
- FISHER, RONALD A. 1960. *The Design of Experiments* 7th ed. New York: Hafner Publishing Inc.
- FOTORESEARCH STOCK PHOTOGRAPHY. 2003. Map of Colorado. [Online] Available: <http://www.fotosearch.com/MAP125/co-1136>.
- "INTRODUCTION." 1838. *Journal of the Statistical Society of London*, 1:1–5.
- FREUDENBURG, WILLIAM R. 2002. "Naval Warfare? The Best of Minds, the Worst of Minds, and the Dangers of Misplaced Concreteness." *Society and Natural Resources*, 15:229–237.
- FREUDENBURG, WILLIAM R. AND ROBERT GRAMLING. 1989. "The Emergence of Environmental Sociology: Contributions of Riley E. Dunlap and William R. Catton, Jr." *Sociological Inquiry*, 59:439–452.
- FREEMAN, LINTON. 1965. *Elementary Applied Statistics*. New York: Wiley and Sons.
- FRIEDLAND, WILLIAM H. 2002. "Agriculture and Rurality: Beginning the 'Final Separation'?" *Rural Sociology*, 67:350–371.
- FRIEDMAN, M. 1937. "The Use of Ranks to Avoid the Assumption of Normality Implicit in the Analysis of Variance." *Journal of the American Statistical Association*, 32:675–701.
- GALPIN, CHARLES J. 1915. "The Social Anatomy of an Agricultural Community." Madison, WI: University of Wisconsin Agricultural Experiment Station Bulletin No. 34.
- GARNER, JOE. 2002, October 19. Surviving the Drought. Water Woes Leave no Hope of Immunity for Ag Community. *Rocky Mountain News*, p. A26.

- GEARY, R. C. 1927. "Some Properties of Correlation and Regression in a Limited Universe." *Metron Rivista Internazionale di Statistica*, 7, 83–119.
- GIBON, ANNICK. 2005. "Managing Grassland for Production, the Environment and the Landscape. Challenges at the Farm and the Landscape Level." *Livestock Production Science*, 96:11–31.
- GLASGOW, NINA AND DAVID L. BROWN. 1998. "Older, Rural, and Poor." In R. T. Coward and J. A. Krout, (Eds.), *Aging in Rural Settings: Life Circumstances and Distinctive Features* (pp. 187–207). New York: Springer Publishing.
- GOOD, PHILLIP. 2000. *Permutation Tests: A Practical Guide to Resampling Methods for Testing Hypotheses* (2nd ed.), New York: Springer-Verlag.
- GOOD, PHILLIP. 2001. *Resampling Methods: A Practical Guide to Data Analysis*. (2nd ed.), Boston, MA: Birkhäuser.
- GOODMAN, L. A., AND W. H. KRUSKAL. 1954. "Measures of Association for Cross Classifications." *Journal of the American Statistical Association*, 49, 732–764.
- HARDIN, GARRET. 1968. "The Tragedy of the Commons." *Science*, 162:1243–1248.
- HAYES, ANDREW F. 1996. "Permutation Test Is Not Distribution-Free: Testing $H_0 : \rho = 0$." *Psychological Methods*, 1:184–198.
- HILBE, JOSEPH. 2000. "Statistical Computing Software Reviews: Section Editor's Notes." *The American Statistician*, 54:72.
- HOEFFDING, WASSILY. 1952. "The Large Sample Power of Tests Based on Permutations of Observations." *Annals of Mathematical Statistics*, 23, 169–192.
- HOLLINGSHEAD, AUGUST B. 1938. "Changes in Land Ownership as an Index of Succession in Rural Communities." *The American Journal of Sociology*, 43:764–777.
- HOLLINGSHEAD, AUGUST B. 1948. "Community Research: Development and Present Condition." *American Sociological Review*, 13:136–156.
- HOMANS, GEORGE C. 1958. "Social Behavior as Exchange." *The American Journal of Sociology*, 63:597–606.
- HOTELLING, HAROLD AND MARGARET RICHARDS PABST. 1936. "Rank Correlation and Tests of Significance Involving no Assumption of Normality." *The Annals of Mathematical Statistics*, 7, 29–43.

- HUDAK, MIKE. 2004. "Public Lands Without Livestock." [Online]. Available <http://www.mikehudak.com/PLWL/PLWL.html>.
- HUNTER, LORI M., JASON D. BOARDMAN, AND JARRON M. SAINT ONGE. 2005. "The Association Between Natural Amenities, Rural Population Growth, and Long-Term Economic Well-Being." *Rural Sociology*, 70:452–469.
- INFORMATION PLEASE. 2005. "States by Order of Entry into Union." [Online]. Available <http://www.infoplease.com/ipa/A0763770.html>.
- INTERNATIONAL TECHNOLOGY ROADMAP FOR SEMICONDUCTORS (ITRS). 2005. [Online]. Available <http://www.itrs.net/Common/2005ITRS/Home2005.htm>.
- JACKSON-SMITH, DOUGLAS B. 2003. "The Challenges of Land Use Change in the Twenty-First Century." In D. L. Brown and L. E. Swanson (Eds.), *Challenges for Rural America in the Twenty-First Century* (pp. 305–316). University Park, PA: The Pennsylvania State University Press.
- JACKSON-SMITH, DOUGLAS B. AND GILBERT W. GILLESPIE. 2005. "Impacts of Farm Structural Change on Farmers' Social Ties." *Society and Natural Resources*, 18:215–240.
- JACKSON-SMITH, DOUGLAS B., URS KREUTER, AND RICHARD S. KRANNICH. 2005. "Understanding the Multidimensionality of Property Rights Orientations: Evidence from Utah and Texas Ranchers." *Society and Natural Resources*, 18:587–610.
- JAMISON, ANDREW. 1998. "The Shaping of the Global Environmental Agenda: The Role of Nongovernmental Organisations." In S. Lash, B. Szerszynski, and B. Wynne, (Eds.), *Risk, Environment, and Modernity: Towards a New Ecology* (pp. 224–245). London: Sage Publications.
- JENSEN, LEIF, DIANE K. MCCLAUGHLIN, AND TIM SLACK. 2003. "Rural Poverty: The Persisting Challenge." In D. L. Brown and L. E. Swanson (Eds.), *Challenges for Rural America in the Twenty-First Century* (pp. 118–131). University Park, PA: The Pennsylvania State University Press.
- JOHNSON, KENNETH M. 2003. "Unpredictable Directions of Rural Population Growth and Migration." In D. L. Brown and L. E. Swanson (Eds.), *Challenges for Rural America in the Twenty-First Century* (pp. 19–31). University Park, PA: The Pennsylvania State University Press.

- JOHNSTON, JANIS E., KENNETH J. BERRY, AND PAUL W. MIELKE, JR. 2006. "Resampling Probability Values for Differences Between Two Independent Indices of Ordinal Variation and Consensus." *Psychological Reports*, to appear.
- KEMPTHORNE, OSCAR. 1952. *The Design and Analysis of Experiments*. New York: Wiley.
- KEMPTHORNE, OSCAR. 1955. "The Randomization Theory of Statistical Inference." *Journal of the American Statistician*, 50, 946–967.
- KENDALL, MAURICE G. 1938. "A New Measure of Rank Correlation." *Biometrika*, 30, 81–93.
- KENDALL, MAURICE G. 1948. *Rank Correlation Methods*. London: Griffin.
- KENDALL, MAURICE G., SHEILA F. H. KENDALL, AND B. BABINGTON SMITH. 1939. "The Distribution of Spearman's Coefficient of Rank Correlation in a Universe in Which All Rankings Occur an Equal Number of Times." *Biometrika*, 30: 251–273.
- KENNEDY, KELLY. 2002, July 7. Grasshoppers Devour What Drought Didn't. *Sunday Denver Post and Rocky Mountain News*. pp. A1, A15.
- KIM, KWANG-KOO, DAVID W. MARCOUILLER, AND STEVEN C. DELLER. 2005. "Natural Amenities and Rural Development: Understanding Spatial and Distributional Attributes." *Growth and Change*, 36: 273–297.
- KLAUSNER, SAMUEL K. 1971. *On Man in His Environment*. San Francisco; Jossey-Bass Inc., Publishers.
- KOLB, JOHN H. 1933. "Trends of County Neighborhoods: 1921–1931." Madison, WI: University of Wisconsin Agricultural Experiment Station Bulletin No. 120.
- KOZIEROK, CHARLES M. 2001. "The PC Guide: Bus Width." [Online]. Available <http://www.pcguide.com/ref/mbsys/buses/funcWidth-c.html>.
- KRANNICH, RICHARD S., DOUGLAS JACKSON-SMITH, AND URS KREUTER. 2002. *Ranching and Farming in Texas and Utah. Understanding the Challenges Facing Landowners and Operators*. Unpublished survey. Institute for Social Science Research on Natural Resources, Utah State University and Department of Rangeland Ecology and Management, Texas A&M University.

- KRANNICH, RICHARD S. AND PEGGY PETRZELKA. 2003. "Tourism and Natural Amenity Development." In D. L. Brown and L. E. Swanson (Eds.), *Challenges for Rural America in the Twenty-First Century* (pp. 190–199). University Park, PA: The Pennsylvania State University Press.
- KRUSKAL, WILLIAM H. AND W. ALLEN WALLIS. 1952. "Use of Ranks on One-Criterion Variance Analysis." *Journal of the Statistical Association*, 47:583–621. Addendum: 1953: 48: 907–911.
- LAFRANCE, JEFFREY T., JAY SHIMSHACK, AND MYLES J. WATTS. 2003. "Grazing Fees versus Stewardship on Public Lands." [Online]. Available http://are.berkeley.edu/courses/envres_seminar/f2003/RANCHING.pdf
- LEARNMONT, MICHAEL. 1997. "Filling the Basin." *Metro* June 19–25. [Online]. Available <http://www.metroactive.com/papers/metro/06.19.97/tv-9725.html>.
- LEOPOLD, ALDO. 1925. "A Plea for Wilderness Hunting Grounds." *Outdoor Life*, November 1925. Reproduced in *Aldo Leopold's Southwest*, edited by David E. Brown & Neil B. Carmony, University of New Mexico Press, 1990.
- LEOPOLD, ALDO. 1987. *A Sand County Almanac, and Sketches Here and There*. New York: Oxford University Press.
- LEOPOLD, ALDO. 1993. *Round River*. New York: Oxford University Press.
- LIVELY, CHARLES E. 1932. "Growth and Decline of Farm Trade Centers in Minnesota 1905–1930. St. Paul: University of Minnesota Agricultural Experiment Station Bulletin No. 287.
- LOBAO, LINDA M. 1996. "A Sociology of the Periphery Versus a Peripheral Sociology: Rural Sociology and the Dimension of Space." *Rural Sociology*, 61:77–102.
- LOBAO, LINDA M. AND KATHERINE MEYER. 1995. "Economic Decline, Gender, and Labor Flexibility in Family-Based Enterprises: Midwestern Farming in the 1980s." *Social Forces*, 74: 575–608.
- LOBAO, LINDA M. AND KATHERINE MEYER. 2001. "The Great Agricultural Transition: Crisis, Change, and Social Consequences of 20th Century Farming." *Annual Review of Sociology*, 27:103–124.
- LOBAO, LINDA M. AND MICHAEL D. SCHULMAN. 1991. "Farming Patterns, Rural Restructuring, and Poverty — a Comparative Regional-Analysis." *Rural Sociology*, 56, 565–602.

- LONG, COLLEEN. 2003, February 8. Western Cattle Biz Trails Off in Drought. *Denver Post*, pp. C1, C7.
- LUCE, R. DUNCAN AND HOWARD RAIFFA. 1957. *Games and Decisions*. New York: Riley.
- LUDBROOK, JOHN AND HUGH DUDLEY. 1998. "Why Permutation Tests are Superior to *t* and *F* Tests in Biomedical Research." *The American Statistician*, 52:127–132.
- LUNNEBORG, C. E. 2000. *Data Analysis by Resampling: Concepts and Applications*. Pacific Grove, CA: Duxbury.
- MACHLIS, GARY E. 1992. "The Contribution of Sociology to Biodiversity Research and Management." *Biological Conservation*, 62:161–170.
- MACTAVISH, KATHERINE AND SONYA SALAMON. 2003. "What Do Rural Families Look Like Today." In D. L. Brown and L. E. Swanson (Eds.), *Challenges for Rural America in the Twenty-First Century* (pp. 73–85). University Park, PA: The Pennsylvania State University Press.
- MANLY, BRYAN F. J. 1997. *Randomization, Bootstrapping and Monte Carlo Methods in Biology*, (2nd ed.), London: Chapman & Hall.
- MANN, HENRY B. 1945. "Nonparametric Tests Against Trend." *Econometrica*, 13:245–249.
- MARTIN, WALTER T. 1957. "Ecological Change in Satellite Rural Areas." *American Sociological Review*, 22:173–183.
- MCCARTHY, M. D. 1939. "On the Application of the *z*-test to Randomized Blocks." *The Annals of Mathematical Statistics*, 10, 337–359.
- MCGRANAHAN, D. 1999. Natural Amenities Drive Rural Population Change. Agricultural information Report 781, October, Food and Rural Economics Division, Economic Research Service, U.S. Department of Agriculture. ERS/USDA publication. [Online]. Available <http://www.ers.usda.gov/Publications/AER781>.
- MCMICHAEL, PHILIP. 1994. *The Global Restructuring of Agro-Food Systems*. Ithaca: Cornell University Press.

- MCMICHAEL, PHILIP. 2003. "The Impact of Global Economic Practices on American Farming." In D. L. Brown and L. E. Swanson (Eds.), *Challenges for Rural America in the Twenty-First Century* (pp. 375–384). University Park, PA: The Pennsylvania State University Press.
- MEADOW, JAMES B. 2002, August 3. Cowpunchers Left on Ropes by Drought. *Rocky Mountain News*, pp. A25–A26.
- MEHTA, CYRUS R. AND NITIN R. PATEL. 1983. "A Network Algorithm for Performing Fisher's Exact Test in $r \times c$ Contingency Tables." *Journal of the American Statistical Association*, 78, 427–434.
- MERTON, ROBERT K. 1949. *Social Theory and Social Structure*. New York: The Free Press.
- MEYER, KATHERINE AND LINDA M. LOBAO. 1994. "Engendering the Farm Crisis: Women's Political Response in the USA." In S. Whatmore, T. Marsden, and P. Lowe (Eds.), *Gender and Rurality* (pp. 69–86). London: David Fulton Publishers.
- MEYER, KATHERINE AND LINDA M. LOBAO. 2003. "Economic Hardship, Religion and Mental Health During the Midwestern Farm Crisis." *Journal of Rural Studies*, 19, 139–155.
- MICCERI, T. 1989. "The Unicorn, the Normal Curve, and Other improbable Creatures." *Psychological Bulletin*, 105, 156–166.
- MIELKE, PAUL W. AND KENNETH J. BERRY. 2001. *Permutation Methods: A Distance Function Approach*, New York: Springer–Verlag.
- MILLER, CHRIS. 1997. "DOE ASCI Teraflops Computer Fully Running for First Time." Sandia National Laboratories. [Online]. Available <http://www.sandia.gov/media/online.htm>.
- MOORE, GORDON. 1975. "Cramming More Components onto Integrated Circuits." *Electronics*, vol. 38. [Online]. Available <http://olivier.ammam.free.fr/scispec/documents/moorepaper.htm>.
- MUIR, JOHN. 1890. "Features of the Proposed Yosemite National Park." *The Century Magazine*, September 1890.
- MUIR, JOHN. 1896. "The National Parks and Forest Reservations." Proceedings of the Meeting of the Sierra Club Held November 23, 1895. Published in *Sierra Club Bulletin*, 1896.

- MUIR, JOHN. 1897. "American Forests." *Atlantic Monthly*, No. 80, 1897 August.
- MUIR, JOHN. 1911. *My First Summer in the Sierra*. Boston: Houghton Mifflin.
- MYERS, JEROME K. 1950. "Assimilation to the Ecological and Social Systems of a Community." *American Sociological Review*, 15:367–372.
- NATIONAL CATTLEMEN'S BEEF ASSOCIATION. 2005. "NCBA and the Environment." [Online]. Available <http://www.beef.org/ncbaenvironment.aspx#publiclands>.
- NATIONAL AGRICULTURAL STATISTICS SERVICE, USDA, (NASS). n.d. "2002 Census of Agriculture, Volume 1, Chapter 2: Colorado County Level Data." [Online]. Available <http://www.nass.usda.gov/census/census02/volume1/co/index2.htm>.
- NATIONAL PARK SERVICE. 1997. *The 125th Anniversary Page*. [Online]. Available <http://www.yellowstone.net/125th.htm>.
- NATIONAL RESOURCES CONSERVATION SERVICE (NRCS). 2003. "National Resources Inventory 2001 Annual NRI: Urbanization and Development of Rural Land." (July). [Online]. Available <http://www.nrcs.usda.gov/Technical/land/nri01/urban.pdf>.
- NOBELPRIZE. 2005. "The History of the Integrated Circuit." [Online]. Available http://nobelprize.org/physics/educational/integrated_circuit/history.
- ONGHENA, PATRICK. 2002. "Exact-Statistics Bibliography Part D: Comprehensive Listing." Katholieke Universiteit Leuven. [Online]. Available <http://www.jiscmail.ac.uk/lists/exact-stats>.
- PATEFIELD, W. M. 1981. "Algorithm AS 159: An Efficient Method of Generating Random $R \times C$ Tables with Given Row and Column Totals." *Applied Statistics*, 30, 91–97.
- PAYTON, MICHELLE A., DAVID C. FULTON, AND DOROTHY H. ANDERSON. 2005. "Influence of Place Attachment and Trust on Civic Action: A Study at Sherburne National Wildlife Refuge." *Society and Natural Resources*, 18:511–528.
- PEARSON, EGON S. 1937. "Some Aspects of the Problem of Randomization." *Biometrika*, 29, 53–64.
- PERDUE, RICHARD R., PATRICK T. LONG, AND YONG SOON KANG. 1999. "Boomtown Tourism and Resident Quality of Life: The Marketing of Gaming to Host Community Residents." *Journal of Business Research*, 44:165–177.

- PHILLIPS, AUTUMN. 2002, September 1. A Last-Ditch Effort. Buyers get Much-Needed Commodity at Hay Auction. *Steamboat Pilot & Today*, pp. A1, A12.
- PIGG, KENNETH E. 1975a. "Part II: A Statement on the State-of-the-Art: Methodologies for Studying Environmental Perceptions, Attitudes, Values, and Beliefs, and the Utilization of Such Studies." *Special Issue on Environmental Sociology, Cornell Journal of Social Relations*, 10:7–61.
- PIGG, KENNETH E. 1975b. "Part I: Introduction." *Special Issue on Environmental Sociology, Cornell Journal of Social Relations*, 10:1–5.
- PIGG, KENNETH E. 1975c. "Part IV: Summary and Critical Comments." *Special Issue on Environmental Sociology, Cornell Journal of Social Relations*, 10:169–183.
- PITMAN, EDWIN JAMES GEORGE. 1937a. "Significance Tests Which May be Applied to Samples From any Populations." *Supplement to the Journal of the Royal Statistical Society* 4, 119–130.
- PITMAN, EDWIN JAMES GEORGE. 1937b. "Significance Tests Which May be Applied to Samples From any Populations. II. The correlation coefficient test." *Supplement to the Journal of the Royal Statistical Society*, 4, 225–232.
- PITMAN, EDWIN JAMES GEORGE. 1938. "Significance Tests Which may be Applied to Samples from any Populations." III. The Analysis of Variance Test." *Biometrika* 29, 350–362.
- PORT, OTIS. 2005. "Holy Screaming Teraflops: IBM's Blue Gene is the World's Fastest Supercomputer – For Now." *BusinessWeek Online*. [Online]. Available http://www.businessweek.com/magazine/content/05_03/b3916086_mz063.htm.
- PUBLIC CITIZEN. 2001. "Down on the Farm: NAFTA's Seven-Years War on Farmers and Ranchers in the U.S., Canada and Mexico." June 26 Public Citizen. Washington D.C. [Online]. Available <http://www.citizen.org/documents/ACFF2.pdf>.
- PUBLIC LANDS GRAZING. n.d. "Public Lands Grazing Declining Economic Factor: Economic Facts of Public Lands Grazing." [Online]. Available http://www.publiclandsranching.org/htmlres/myth_plr_economics.htm.
- RANGENET. 2000. "Save Our Public Lands – End Public Lands Grazing." [Online]. Available <http://www.rangenet.org/rn2k/declaration.html>.
- "Range Restoration and Grazing Reform." n.d. *Center for Biological Diversity*. [Online]. Available <http://www.biologicaldiversity.org/swcbd/Programs/grazing/>.

- READ, T. R. C. AND N. A. C. CRESSIE. 1988. *Goodness-of-Fit for Discrete Multivariate Data*. New York: Springer-Verlag.
- READY, RICHARD C. AND CHARLES W. ABDALLA. 2005. "The Amenity and Disamenity Impacts of Agriculture: Estimates from a Hedonic Pricing Model." *American Journal of Agricultural Economics*, 87:314–326.
- RENGERT, KRISTOPHER M. AND ROBERT E. LANG. 2001. "Cowboys and Cappuccino: The Emerging Diversity of the Rural West." *Fannie Mae Foundation Census Note 04*. [Online]. Available <http://www.fanniemaefoundation.org/programs/pdf/census/Cowboys.pdf>.
- RIEBSAME, WILLIAM E., HANNAH GOSNELL, AND DVAID THEOBALD. 1997. *Atlas of the New West*. New York: W.W. Norton & Company.
- RIGG, JONATHAN. 2006. "Land, Farming, Livelihoods, and Poverty: Rethinking the Links in the Rural South." *World Development*, 24:180–202.
- ROCKY MOUNTAIN NEWS. 2002. "Group Sues to Stop Grazing." Denver Colorado, 6A.
- ROSA, EUGENE A. AND GARY E. MACHLIS. 2002. "It's a Bad Thing to Make One Thing Into Two: Disciplinary Distinctions as Trained Incapacities." *Society and Natural Resources*, 15:251–261.
- ROSENBERGER, JACK. 2005. Wasting the West: How Welfare Ranchers and Their Livestock Are Damaging Public Land. *emagazine.com* [Online]. Available <http://www.emagazine.com/view/?1855>.
- ROUTHE, AARON S., ROBERT EMMET JONES, AND DAVID L. FELDMAN. 2005. "Using Theory to Understand Public Support for Collective Actions that Impact the Environment: Alleviating Water Supply Problems in a Nonarid Biome." *Social Science Quarterly*, 86:874–897.
- ROWE, HELEN IVY AND E. TOM BARTLETT. 2001. Development and federal grazing policy impacts on two Colorado counties: a comparative study. In: L. A. Torrell, E. T. Bartlett, and R. Larranaga (eds.), Current issues in rangeland resource economics, Proc. of a Symp. sponsored by Western Coordinating Committee on Range Economics (WCC-55), A Western Regional Publication, New Mexico State Univ. Agr. Exp. Sta. Res. Rep. 737. pp. 59–74.
- ROWE, HELEN IVY, E. TOM BARTLETT, AND LOUIS E. SWANSON, JR. 2001. "Ranching Motivations in 2 Colorado Counties." *Journal of Range Management*, 54, 313–321.

- RUDEL, THOMAS K. 2002. "Sociologists in the Service of Sustainable Development?: NGOs and Environment-Society Studies in the Developing World." *Society and Natural Resources*, 15:263–268.
- S-PLUS 2000. MathSoft Inc., Seattle.
- SAENZ, ROGELIO AND CRUZ C. TORRES. 2003. "Latinos in Rural America." In D. L. Brown and L. E. Swanson (Eds.), *Challenges for Rural America in the Twenty-First Century* (pp. 57–70). University Park, PA: The Pennsylvania State University Press.
- SALAZAR, GARY E. 2002. "Rancher's May Shape Policy through Survey." *Craig Daily Press*, Craig, p. 12.
- SALSBURG, DAVID. 2001. *The Lady Tasting Tea: How Statistics Revolutionized Science in the Twentieth Century*. New York: Henry Holt.
- SANDERS, PEGGY. 2002, September 13. Ranchers are Down, But Don't Count Them Out. *Craig Daily Press* p. 5.
- SAS 6.12. 1999. SAS Institute Inc., Cary, NC.
- SCHEFFÉ, HENRY. 1959/1999. *The Analysis of Variance*. Wiley Classics Library Ed. New York: Wiley-Interscience Publication.
- SCHNAIBERG, ALLAN. 1972. "Environmental Sociology and the division of Labor." Department of Sociology, Northwestern University.
- SCIENCE NEWS. 2005 . "Technology: Transistor Laser Flaunts Twin Talents." V. 168, 237.
- SEEMAN, ALBERT L. 1938. "Communities in the Salt Lake Basin." *Economic Geography*, 14:300–308.
- SIERRA CLUB. 2000. "Sierra Club Policies: Federal Public Lands Grazing Policy." [Online]. Available <http://www.sierraclub.org/policy/conservation/grazing.asp>.
- SMITH, MICHAEL D. AND RICHARD S. KRANNICH. 2000. "'Culture Clash' Revisited: Newcomer and Longer-Term Residents' Attitudes Toward Land Use, Development, and Environmental Issues in Rural Communities in the Rocky Mountain West." *Rural Sociology*, 63:396–421.
- SOMERS, R. H. 1962. "A New Asymmetric Measure of Association for Ordinal Variables." *American Sociological Review*, 27, 799—811.

- SOROKIN, PITIRIM A. AND CARLE C. ZIMMERMAN. 1929. *Principles of Rural-Urban Sociology*. New York: Henry Holt and Company.
- SOROKIN, PITIRIM A., CARLE C. ZIMMERMAN, AND CHARLES J. GALPIN. 1930. *Systematic Source Book of Rural Sociology*. Minneapolis: University of Minnesota Press.
- SPANO, RICHARD AND STEVE NAGY. 2005. "Social Guardianship and Social Isolation: An Application and Extension of Lifestyle/Routine Activities Theory to Rural Adolescents." *Rural Sociology*, 70:414–437.
- SPLAWA-NEYMAN, JERZY. 1923. "On the Application of Probability Theory to Agricultural Experiments. Essay on Principles. Section 9. *Roczniki Nauk Rolniczych Tom X*, translated by D. M. Dabrowska and T. P. Speed (1990) in *Statistical Science*, 5, 465–472.
- SPSS 8.0 1999. SPSS, Inc., Chicago.
- STALLINGS, WILLIAM. 2006. *Computer Organization & Architecture: Designing for Performance*. Upper Saddle River, NJ: Pearson.
- STATXACT 4.0. 1989. Cytel Software Corporation, Cambridge, MA.
- STEADMAN, RICHARD C. 2003. "Is it really just a social construction? The contribution of the physical environment to sense of place." *Society and Natural Resources*, 16:671–685.
- STEADMAN, RICHARD C. AND ROGER B. HAMMER. 2006. "Environmental Perception in a Rapidly Growing, Amenity-Rich Region: The Effects of Lakeshore Development on Perceived Water Quality in Vilas County, Wisconsin." *Society and Natural Resources*, 19:137–151.
- STEADMAN, RICHARD C., TOM BECKLEY, SARA WALLACE, AND MARK AMBARD. 2004. "A Picture and 1000 Words: Using Resident-Employed Photography to Understand Attachment to High Amenity Places." *Journal of Leisure Research*, 36:580–606.
- STEAMBOAT REALTY. 2006a. "Residential Farm and Ranch." Moffat County. [Online]. Available http://www.steamboatproperties.com/property_details.php?Mls_Num=112494&whichForm=full&Offset=20&whichForm=full&Order_By=Asking_Price+ASC&Limit=10&Area_Moffat=yes&x=164&y=14&.
- STEAMBOAT REALTY. 2006b. "Incredible Dakota Ridge!" Routt County. [Online]. Available <http://www.steamboatrealstate.com/cgi-bin/display-homes-indiv.cgi?sfl=MLS&words=MLS112033&x=21&y=18>.

- STUART, A. 1953. "The Estimation and Comparison of Strengths of Association in Contingency Tables." *Biometrika*, 40, 105–110.
- SWANSON, LOUIS E. 2001a. "Rural opportunities: Minimalist policy and community-based experimentation." *Policy Studies Journal*, 29:96–107.
- SWANSON, LOUIS E. 2001b. "Rural policy and direct local participation: Democracy, inclusiveness, collective agency, and locality-based policy." *Rural Sociology*, 66:1–21.
- SZERSZYNSKI, BRONISLAW. 1998. "On Knowing What to Do: Environmentalism and the Modern Problematic." In S. Lash, B. Szerszynski, and B. Wynne, (Eds.), *Risk, Environment, and Modernity: Towards a New Ecology* (pp. 104–138). London: Sage Publications.
- TOOLE, BETTY. 2000. "Ada Byron, Lady Lovelace." [Online]. Available <http://www.agnesscott.edu/lriddle/women/love.htm>.
- TRUMBO, CRAIG W. AND GARRETT J. O'KEEFE. 2005. "Intention to Conserve Water: Environmental Values, Reasoned Action, and Information Effects Across Time." *Society and Natural Resources*, 18:573–585.
- UNIVERSITY OF VIRGINIA LIBRARY. 2005. "Historical Census Browser." [Online]. Available <http://fisher.lib.virginia.edu/collections/stats/histcensus/>.
- VON NEUMANN, JOHN. 1945. "First Draft of a Report on the EDVAC." In *The Anatomy of a Microprocessor: A Systems Perspective*, by Shriver & Smith. [Online]. Available <http://www.virtualtravelog.net/entries/2003-08-TheFirstDraft.pdf>.
- VON NEUMANN, JOHN AND OSCAR MORGENSTERN. 1964. *Theory of Games and Economic Behavior*, 3rd ed. New York: Wiley.
- WALD A., AND J. WOLFOWITZ. 1943. "An Exact Test for Randomness in the Non-Parametric Case Based on Serial Correlation." *Annals of Mathematical Statistics*, 14, 378–388.
- WALD A., AND J. WOLFOWITZ. 1944. "Statistical Tests Based on Permutations of the Observations." *Annals of Mathematical Statistics*, 15, 358–372.
- WARREN, WILLIAM A. 2005. "Hierarchy Theory in Sociology, Ecology, and Resource Management: A Conceptual Model for Natural Resource or Environmental Sociology and Socioecological Systems." *Society and Natural Resources*, 18:447–466.

- WASTE OF THE WEST: PUBLIC LANDS RANCHING. 2005. [Online]. Available <http://www.wasteofthewest.com>.
- WEB OF SCIENCE. 2006. "Citation Database." The Thomson Corporation. [Online]. Available <http://portal.isiknowledge.com/portal.cgi?DestApp=WOS&Func=Frame&Init=Yes&SID=D19CGH4n7H9Jle1M5FE>.
- WELCH, B. L. 1937. "On the z-test in Randomized Blocks and Latin squares." *Biometrika*, 29, 21–52.
- WELCH, B. L. 1938. "On Tests for Homogeneity." *Biometrika*, 30, 149–158.
- WELFARE RANCHING: THE SUBSIDIZED DESTRUCTION OF THE AMERICAN WEST. 2002. George Wuerthner and Mollie Yoneko Matteson, Eds. Washington, D.C.: Island Press.
- WIKIPEDIA. 2005. "Magnetic Core Memory" [Online]. Available http://en.wikipedia.org/wiki/Core_memory.
- WILCOXON, F. 1945. "Individual Comparisons by Ranking Methods." *Biometrics*, 1:80–83.
- WILDERNESS SOCIETY. 2000. "Economic Profiles for Colorado Counties." [Online]. Available http://www.wilderness.org/Library/Documents/EconProfile_ColoradoCounties.cfm.
- WILSON, WARREN H. 1912. *The Evolution of the Country Community*. Boston: Pilgrim Press.
- WYNNE, BRIAN. 1998. "May the Sheep Safely Graze? A Reflexive View of the Expert-Lay Knowledge Divide." In S. Lash, B. Szerszynski, and B. Wynne, (Eds.), *Risk, Environment, and Modernity: Towards a New Ecology* (pp. 44–83). London: Sage Publications.
- ZAGARE, F. C. 1984. *Game Theory: Concepts and Applications*. Beverly Hills, CA: Sage Publications.
- ZEKERI, ANDREW A. 1999. "Community-ness of a Major Economic Development Effort in a Biracial Community of Alabama." *Journal of Rural Studies*, 15:159–169.
- ZIMMERMAN, CARLE C. 1930. "Farm Trade Centers in Minnesota 1905–1929." St. Paul University of Minnesota Agricultural Experiment Station Bulletin No. 269.

ZOLLINGER, BRETT AND RICHARD S. KRANNICH. 2002. "Factors Influencing Farmers' Expectations to Sell Agricultural Land for Non-Agricultural Uses." *Rural Sociology*, 67:442–463.

APPENDIX 1

(This survey has been modified to fit the margins of this text)

Agriculture is facing an uncertain future. We would like to gain more insight into this issue by asking you some questions that may seem intrusive but that will help sustain ranching and farming into the future. As noted in the cover letter, we will not see any of the completed questionnaires.

It is important we hear back from everyone who receives a survey, even if they are not involved in farming or ranching. We thank you for taking the time to place the entire questionnaire in the enclosed addressed envelope, and return it to us. No postage is necessary. We appreciate your assistance and cooperation.

Thank you very much for helping all of us with this important work.

Are you the owner, operator, leasee, or manager of an operating ranch or farm that includes at least 100 acres of private lands?

- ☐ No Please stop here and return the survey in the envelope provided.
- ☐ Yes Please go to SECTION A below and complete the rest of the questionnaire.

SECTION A – CHARACTERISTICS OF YOUR RANCH OR FARM

We want to begin by asking about your ranching or farming operation. Please fill in the requested information or check ONE box that best describes you or your ranch/farm, unless otherwise stated.

A1. In which county is your ranch or farm primarily located?

A2. How would you describe your role at this ranch or farm?

- ☐ I am the person who makes most of the day-to-day management decisions and I have an ownership interest in this ranch or farm.
- ☐ I am one of several key decision makers with an ownership interest in this ranch or farm
- ☐ I am the spouse of a key decision maker with an ownership interest in this ranch or farm
- ☐ I am a hired farm manager with no ownership interest in this ranch or farm

Other, Please describe: _____

- A3. ***How is your ranch or farm business organized?***
- ☐ Sole proprietorship (single family or individual operation)
 - ☐ Family partnership
 - ☐ Non-family partnership
 - ☐ A family corporation
 - ☐ A non-family corporation
- A4. ***How much of the total ranch or farm labor on your operation is provided by you or members of your family?***
- ☐ All ☐ Most ☐ Less than ½ (most labor done by paid, nonfamily workers)
- A5. ***What is the primary activity on your ranch or farm? (Check only ONE box)***
- ☐ Mainly crop production
 - ☐ Mainly livestock production
 - ☐ Mainly a wildlife operation
 - ☐ Mixed crop and livestock operation
 - ☐ Farm or ranch combined with wildlife operation
 - ☐ Tourist operation (e.g., dude ranch, bed and breakfast, etc.)
 - ☐ Primary residence or weekend hideaway that generates no significant income
- A6. ***Approximately what percent of your ranch or farm income is derived from each of the following activities? (Please be your answers total to 100%)***
- Income from the sale of crops
 - Income from the sale of livestock
 - Income from the sale of wildlife or exotic species as breeding stock
 - Fees for hunting of native game species
 - Fees for hunting exotic wildlife (European deer, African antelope, etc.)
 - Income from recreation related activities (other than hunting)
 - Government program payments
 - Mineral sales and leases
 - Other (Please specify _____)
- Total = 100 %**
- A7. ***How many acres of land do you OWN in your ranch/farm operation?***
- A8. ***Did you raise crops as part of your ranch or farm business in 2001?***
- ☐ No → Please skip to question A9 on the next page.
 - ☐ Yes → Please answer the following questions.

- (a) ***How many acres of cropland were used for the following purposes?***

Irrigated cropland used primarily to raise hay

Irrigated cropland used primarily to raise other crops

Unirrigated cropland used primarily to grow crops

Other cropland uses (specify: _____)

Total cropland acres operated in 2001

(Total should be sum of above components)

- A9. ***Did you raise livestock as part of your ranch or farm business in 2001?***

☐ No → Please skip to question A11 on the next page.

☐ Yes → Please answer the following question.

- (a) ***How many of each of the following livestock did you have on Jan. 1, 2002?***

(If you have none of a particular kind, write a 0.)

Type of animal

Mature beef cows and bulls

Beef or dairy heifers, stockers, and calves

Mature ewes, goats, rams and bucks

Lambs or goat kids

Horses

- A10. ***Did you graze any LIVESTOCK as part of your farm or ranch business in 2001?***

☐ No → Please skip to question A11 on the next page.

☐ Yes → Please answer the following questions.

- (a) ***Approximately what percent of the total forage consumed by your grazing livestock in 2001 came from the following types of land? (Please be sure your answers total to 100%.)***

Type of Grazing Land

Private pasture or rangeland that you own

Private pasture or rangeland that you leased from other landowners

Federal lands on which you had grazing leases

State or other public lands on which you had grazing leases

Other (specify: _____)

- (b) ***Which of the following grazing management practices do you generally use?***

	<i>Don't Use</i>	<i>Use</i>
Regularly monitor grazing resources	☐	☐
Adjust stocking rates according to changes in amount of forage	☐	☐
Use rotational grazing and/or resting system or herd livestock	☐	☐
Provide relatively evenly distributed water points	☐	☐
Place supplemental licks away from water points	☐	☐
Restrict livestock access to riparian areas	☐	☐

A11. **Do you allow *HUNTING OR RECREATION ACTIVITIES* on your ranch or farm?**

- ☐ No → Please skip to Section B on the next page.
☐ Yes → *Which of the following activities do you allow?*

	<i>Don't Allow</i>	<i>Allow</i>
No charge access to family, friends, employees for hunting, fishing, recreation	☐	☐
No charge public access for hunting, fishing or birding	☐	☐
Fee-based access to outfitters, groups, or clubs for hunting or fishing	☐	☐
Fee-based access to individuals for hunting or fishing	☐	☐
Fee-based camping, hiking, horse riding, or other recreation activities	☐	☐

SECTION B – FUTURE PLANS

In this section we would like you to share your concerns and plans for the future. The next question lists some possible threats to ranching and farming in the West.

B1. ***Please indicate how you think each of the following factors will affect the future viability of your ranch or farm operation. (For each type of threat, please circle the answer that indicates how likely you think it is to occur, and then, how you think your operation would be affected by such a change if it occurred.)***

B2. Over the next 5 years, how likely are you make the following changes to your ranch or farm operation?

-3 = very unlikely ... 0 = uncertain ... +3 = very likely

Diversify into other ranch or farm enterprises.
Seek more non-agricultural income from your land.
Expand by buying more ranch or farmland.
Expand by leasing more ranch or farmland.
Sell land to another rancher or farmer.
Sell land for purposes other than agriculture.
Increase livestock numbers.
Decrease livestock numbers.
Transfer ownership of ranch/farm to someone else.
Transfer management of your ranch/farm to someone else.
Relocate the operation.

B3. Over the next 5 years, how likely are you to do the following things?

-3 = very unlikely ... 0 = uncertain ... +3 = very likely

Become more involved in local politics.
Become politically more involved in agricultural interest groups.
Become less involved in community activities.
decrease public access to your land.
Seek legal recourse to defend your landowner rights.
Increase household income from off-farm sources.

B4. How do you feel public lands should be used?

-3 = very unlikely ... 0 = uncertain ... +3 = very likely

Public lands should be open for recreational uses with no conditions or limitations.
Public lands should be open for recreational uses with limitations.
Public lands should be closed for recreational uses.
Public land should be primarily used as a wildlife habitat.
The public should have access to public land through private land

B5. The following statements concern attitudes about ranchers and their environment.

-3 = strongly disagree ... 0 = neutral ... +3 = strongly agree

The US government should have authority in achieving environmental policy.
State governments should have authority in achieving environmental policy.
Local governments should have authority in achieving environmental policy.
Conservation easements are a means for achieving environmental policy.
Local environmental groups are good to work with.
National environmental groups are good to work with.
Ranchers are more concerned about the environment than profitability.
Ranchers are good environmentalists.
For ranchers to be profitable they may have to hurt the environment.
Environmental groups are knowledgeable about ranching and its effect on the environment.
Ranchers are more concerned about profits than the environment.

B6. What is your relation with county and State extension?

-3 = strongly disagree ... 0 = neutral ... +3 = strongly agree

The local extension office provides important services for the ranching community.
The State extension office provides important services for the ranching community.
I have a good working relationship with the extension agents in my community.
I utilize the local extension office frequently.
I have never utilized my local extension office.

B7. How I feel about my community

-3 = strongly disagree ... 0 = neutral ... +3 = strongly agree

Making a living in ranching in Colorado is more difficult now than 10 years ago.
--

Population growth in my county threatens my ranching operation.
Population growth pays its own way in my county.
New residents have made my county a better place to live.
My county is a very good place to live.
The quality of life in my county is good.
Ranching is LESS important to my county's quality of life than 10 years ago.
My county is a friendly place to live.
Ranchers generally have good relations with their non-ranching neighbors.
I identify more with a region than a particular community (for example Steamboat or Craig)

SECTION C – RIGHTS & RESPONSIBILITIES REGARDING THE USE OF PRIVATE LANDS

This section requests information about your perceptions about landowner rights and obligations and the use of natural resources on your land.

Please indicate your opinion about each statement below by circling a number between “-3” to “+3” Minus three (-3) indicates very strong disagreement, 0 indicates a neutral opinion, and +3 indicates very strong agreement.

C1. *To what extent do you agree or disagree with each of the following statements about your RIGHTS as a landowner?*

-3 = *strongly disagree* ... 0 = *neutral* ... +3 = *strongly agree*

My landowner rights include the <i>right to exclude others</i> from access to my land.
My landowner rights include the <i>right to transfer ownership</i> of my land to others without restriction.
My landowner rights allow me the <i>exclusive use</i> of the natural resources provided by the land.
My landowner rights include the <i>absolute right</i> to do whatever I want with my land without regard for what others prefer.
My landowner rights allow me to do anything with my land so long as my actions <i>do not infringe upon my neighbors' rights</i> .
My landowner rights allow me to do anything with my land so long as my actions <i>do not conflict with the interests and values of the local community</i> .

My landowner rights must be sensitive to the <i>values and interests of society at large</i> .
My rights as a landowner have become <i>increasingly restricted</i> over time.
Natural resources on my land <i>belong to society</i> , which allows the public to restrict land uses that cause resource damage.
Restrictions on my rights as a landowner are a <i>threat to my civil liberty</i> .

C2. ***To what extent do you agree or disagree with each of the following statements about your RESPONSIBILITIES as a landowner?***

-3 = *strongly disagree* ... 0 = *neutral* ... +3 = *strongly agree*

My landowner rights place <i>no obligations</i> on me.
My landowner rights obligate me to be a <i>good steward of my land</i> and to maintain it in good condition for future generations
My landowner rights should obligate me to <i>leave the land in better shape</i> than when I acquired it.
My landowner rights should obligate me to <i>take into account the values and interests of society at large</i> .

C3. ***To what extent do you think that WELL-DEFINED PROPERTY RIGHTS promote each of the following outcomes in society? (Circle the number that best represents your views or check the box if you are not sure of your answer.)***

-3 = *strongly disagree* ... 0 = *neutral* ... +3 = *strongly agree*

Respect for one's neighbors and other people
Good land stewardship
Increased investment in the land
Better relationships and interactions among neighbors
Landowner interest in broader public concerns

C4. ***In which of the following conservation programs have you participated in the last 5 years? (Check all that apply)***

- ☐ USDA Conservation Reserve Program (CRP)
- ☐ USDA Environmental Quality Incentive Program (EQIP)
- ☐ State-sponsored private land wildlife management programs
- ☐ Cooperative wildlife management planning with other landowners

C5. *To what extent do you agree that you should be **REQUIRED TO DO** each of the following things with your land **WITHOUT ANY COMPENSATION** from the public?*

-3 = strongly disagree ... 0 = neutral ... +3 = strongly agree

Control noxious weeds
Protect the quality and supply of water used on your land
Protect water quality and supply for downstream users
Protect wetland and riparian areas
Provide access to your land for hunting of native species
Protect habitat for threatened and endangered species

C6. *To what extent do you agree that you should be **REQUIRED TO DO** each of the following **PROVIDED YOU RECEIVE ADEQUATE COMPENSATION** from the public?*

-3 = strongly disagree ... 0 = neutral ... +3 = strongly agree

Control noxious weeds
Protect the quality and supply of water used on your land
Protect water quality and supply for downstream users
Protect wetland and riparian areas
Provide access to your land for hunting of native species
Protect habitat for threatened and endangered species

C7. *How likely do you think that landowners like you would **VOLUNTARILY DO** each of the following **PROVIDED THEY RECEIVE ADEQUATE COMPENSATION** from the public?*

-3 = very unlikely ... 0 = neutral ... +3 = very likely

Control noxious weeds
Protect the quality and supply of water used on your land
Protect water quality and supply for downstream users

Protect wetland and riparian areas
Provide access to your land for hunting of native species
Protect habitat for threatened and endangered species

C8. To what extent do you agree with each of the following statements about PUBLIC LAND?

-3 = strongly disagree ... 0 = neutral ... +3 = strongly agree

Public land belongs equally to all members of the American public
The public generally has a good understanding about the effects of grazing on public lands.
Federal agencies are sensitive to the concerns of local ranchers.
Federal agencies adequately understand local issues and conditions.
Environmental groups are sensitive to concerns of local ranchers.
Local area communities should have special influence on how natural resource management decisions are made on public land.
Since grazing permittees pay to use public land while recreationists usually don't, permittees should have a greater say in the use of public land.
Landowners would more willingly accept decisions about public land use if land managers seriously considered their concerns.
Agencies should not be able to change grazing permits without input agreement from the permittees.

C9. To what extent do you agree with each of the following statements about FEDERAL LAND MANAGEMENT?

-3 = strongly disagree ... 0 = neutral ... +3 = strongly agree

Decisions about the use and management of Federal lands should be made exclusively by the <i>agencies assigned to administer them</i> .
The management authority for Federal lands should be handed over to <i>state government</i> .
The management authority for Federal lands should be handed over to <i>county government</i> .

The management authority for Federal lands should be handed over to <i>associations of grazing permittees</i> .
Federal land should be privatized through public auctions.
Federal lands should be managed through <i>coordinated resource management planning</i> (CRMP) that involves all interested parties.

SECTION D – IMPACT ON RANCHES AND FARMS

In recent years various economic, social, and political factors have influenced the way public and private lands are managed. In this section we are seeking information about how your ranch or farm operation has been affected by these external forces.

For each of the possible forces listed below, please indicate how your operation has been influenced positively or negatively over the last 5 years. In each case, circle the number between –3 and +3 that best reflects your experiences.

D1. *How have each of the following ECONOMIC FACTORS affected the viability of your ranch or farm operation?*

-3 = very strong negative effect ... 0 = no effect ... +3 = very strong positive effect

Persistent drought resulting in low production.
Declining profitability of agricultural and livestock production.
Declining prices for agricultural products.
Increasing prices of inputs.
Increasing competition for beef from pork and chicken.

D2. *How have each of the following SOCIAL FACTORS affected the viability of your ranch or farm operation?*

-3 = very strong negative effect ... 0 = no effect ... +3 = very strong positive effect

Increased public willingness to spend more money on recreation and hunting activities
Declining financial ability of younger generations to take over farm or ranch operations.
Declining interest among younger generations in ranching or farming

as a way of life.
Increased trespass problems on ranch or farm operations due to growing population and declining respect for private property
Decline in public support for ranching and agriculture.
Increasing public demand for environmental protection.
More stringent environmental regulations.

D3. How have each of the following LAND RELATED ISSUES affected the viability of your ranch or farm operation?

-3 = very strong negative effect ... 0 = no effect ... +3 = very strong positive effect

High market prices for land that exceed the productive value of land in your area.
Subdivision of land surrounding or near your ranch or farm.
Expansion of urban land uses and the associated restrictions on rural land use options.
Increasing impact of displaced wildlife populations due to increased human activity in your area.
Increased demand for hunting and other recreation activities has reduced the availability of private land for grazing in your area.
Decreased availability of public lands for grazing livestock.
High property taxes.
High estate (death) taxes.

D4. How have each of the following LAWS, REGULATIONS, AND GOVERNMENT PROGRAMS affected your ability to manage your land the way that you would like to?

-3 = very strong negative effect ... 0 = no effect ... +3 = very strong positive effect

Historical water rights laws in which older water rights supersede more recent water rights.
Regulations to protect wetlands and riparian areas.
Clean water and effluent discharge regulations.

Endangered species habitat regulations.
Greater restrictions on predator control.
Tighter regulations on fertilizer, pesticide or herbicide use.
Reduction or elimination of public land grazing permits.
County or local land use and zoning regulations that restrict high density livestock production systems
USDA Conservation Reserve Program (CRP)
USDA Environmental Quality Incentive Program (EQIP)

D5. ***Did you rely on public land leases for grazing any of your livestock in 2001?***

☐ No → Please skip to Section E on the next page.

☐ Yes → ***To what extent do you agree with each of the following statements about the effects of CHANGES IN PUBLIC LAND GRAZING POLICIES on your operation?***

-3 = strongly disagree ... 0 = neutral ... +3 = strongly agree

Increased pressure to reduce livestock on public land is affecting your ability to survive as an independent operator
Uncompensated forced early removal of livestock from public land has increased your operating costs
Increased use of public land by recreationists has resulted in loss of or injury to cattle, destruction of fencing, etc.
Increased use of public lands by recreationists has resulted in increased trespass on your nearby private land
At public meetings to address conflicts over public land use, ranchers' and farmers' concerns are usually weighed equally with those of other interests

SECTION E – PERSONAL INFORMATION

For us to compare the responses of people with similar or different characteristics, we ask you to provide us some information about yourself and your family. Please remember **ALL INFORMATION THAT YOU PROVIDE WILL BE TREATED IN THE STRICTEST CONFIDENCE** (as noted in the cover letter and page 1 of this survey).

E1. ***In which year were you born?*** _____

- E2. ***What is your gender?*** ☐ Male ☐ Female
- E3. ***What is your highest level of formal education?***
- | | |
|---|--|
| ☐ Some high school or less degree | ☐ Completed 2-year college degree |
| ☐ High school diploma or equivalent college degree | ☐ Completed a four-year degree |
| ☐ Trade school/formal apprenticeship degree | ☐ Completed a graduate degree |
- E4. ***Did you or your spouse grow up on a ranch or farm?***
- | | | | |
|-------------|-----------------------------|------------------------------|--------------------------------------|
| You | ☐ No | ☐ Yes | |
| Your spouse | ☐ No | ☐ Yes | ☐ Not married |
- E5. ***Since age 18, how many years of ranching or farming experience do you have?*** _____
- E6. ***For how long have you or your family owned or operated this ranch or farm? (Check only ONE box)***
- ☐ Less than 3 years
- ☐ 3-10 years
- ☐ 11-25 years
- ☐ More than 25 years (single generation)
- ☐ More than one generation (How many generations? _____)
- ☐ I manage but don't own the ranch or farm
- E7. ***Do you currently live on your ranch or farm?***
- ☐ Yes → Please skip to question E8 below.
- ☐ No → Please answer the following question.
- (a) ***How far from your ranch or farm do you live?***
- ☐ Less than 10 miles from your ranch or farm
- ☐ 11-50 miles from your ranch or farm
- ☐ 51 to 100 miles from your ranch or farm
- ☐ More than 100 miles from your ranch or farm
- E8. ***In which of the following types of associations or organizations in your community are you or your spouse involved? (Check the most appropriate box for each)***
- | | | | |
|--------------------------|--------------------------|--------------------------|---|
| Not involved | Somewhat involved | Very involved | |
| ☐ | ☐ | ☐ | Church groups (choir, church board, etc.) |

- | | | | |
|--------------------------|--------------------------|--------------------------|--|
| ☐ | ☐ | ☐ | Civic organizations (Rotary, Kiwanis, VFW, etc.) |
| ☐ | ☐ | ☐ | Non-church related athletic/recreation groups (softball, soccer, etc.) |
| ☐ | ☐ | ☐ | Educational/school groups (PTA/PTO, band boosters, etc.) |
| ☐ | ☐ | ☐ | Youth-oriented organizations (4-H, Scouts, etc.) |
| ☐ | ☐ | ☐ | Community government (village, town, county boards, etc.) |
| ☐ | ☐ | ☐ | Ranch/farm organizations (Farm Bureau, Cattlemen's Assn., etc.) |
| ☐ | ☐ | ☐ | Others (Please describe _____) |

SECTION F – FINANCIAL OVERVIEW

Finally, to properly understand differences among landowners' perceptions about their rights, we must gather some basic financial information. Often, non-agricultural people concerned about environmental issues don't appreciate the economic stresses that ranchers and farmers face. Your willingness to share some limited financial information will enable us to provide an accurate report on the status of ranchers and farmers to public policy makers who make decisions about rural land.

We understand that you may be uncomfortable sharing this information with an outsider. However, we want to assure you that **YOUR RESPONSES WILL BE KEPT STRICTLY CONFIDENTIAL**, and we will never release them to any individual, business, or government agency. Results of this study will be reported only in the form of statistical summaries of many operations. At no time will the identity of your operation be disclosed. We thank you in advance for your willingness to provide this information.

- F1. *Please check the category that most accurately reflects your overall level of investment in fixed improvements on your ranch or farm during the last five years. (By fixed improvements we mean such things as contouring, fixed irrigation systems, fencing, water facilities, roads, brush clearing, etc. Please do not include moveable equipment or operating expenses such as fertilizer, supplemental feeds, veterinary expenses, etc. in this estimate.)*

- | | |
|--|--|
| ☐ Under \$1,000 | ☐ \$1,000-\$9,999 |
| ☐ \$10,000-\$24,999 | |
| ☐ \$25,000-\$49,999 | ☐ \$50,000-\$99,999 |
| ☐ Over \$100,000 | |

- F2. *Did your ranch or farm show a profit in 2001?*

- | | | |
|-----------------------------|------------------------------|-----------------------------------|
| ☐ No | ☐ Yes | ☐ Not Sure |
|-----------------------------|------------------------------|-----------------------------------|

- F3. *In 2001, did you have any regular off-ranch or off-farm job?*

- | | |
|-----------------------------|------------------------------|
| ☐ No | ☐ Yes |
|-----------------------------|------------------------------|

- F4. *In 2001, did your spouse have any regular off-ranch or off-farm job?*
☐ No ☐ Yes ☐ Not Married
- F5. *What proportion of your household's total income usually comes from your net ranch or farm income?*
☐ under 10% ☐ 11-25% ☐ 26-50% ☐ 51-75%
☐ over 75%
- F6. *How has the proportion of your household's total income obtained from your ranch or farm changed during the last 10 years?*
☐ Increased ☐ Decreased ☐ Stayed about the same
- F7. *Please check the category that best represents your household's total income before taxes in 2001? (Include net ranch or farm income, income from wages, salaries, nonfarm businesses, rental payments, investments, retirement accounts, and any other major income sources).*
☐ Less than \$25,000
☐ \$25,001 - \$50,000
☐ \$50,001 - \$75,000
☐ \$75,001 - \$100,000
☐ \$100,001 - \$500,000
☐ Greater than \$500,000

Please write any other comments or suggestions that can help us better understand the situation of ranches and farms like your own.

.....

THANK YOU FOR TAKING THE TIME TO FILL OUT THIS QUESTIONNAIRE. Your participation is greatly appreciated. Please send the completed questionnaire to us in the enclosed postage-paid envelope. If you would like a copy of the compiled results, please call your local extension office to be added to the list of people requesting the survey.

Appendix 2

“We have just enough acreage [sic] to cost us but not enough to work it full time. Operating expenses have forced us to lease out hay production and rely on CRP to make the ranch viable. I am not sure how long we will maintain it. It may just become a “retreat” if the economy keeps costs rising. It is not like it was 20 years ago.” **342 Moffat**

“We are starting up this operation. We are in the process of fencing, water wells, and forage improvement so that the land can be used for grazing eventually. The previous owners left the land in very poor condition. As a result of this there is no income from the property at this time” **300 Moffat**

“The agriculture has been reduced to “Wards of the State” very disgusting situation” **518 Routt**

“One other concern facing our operation is the turmoil over animal health, i.e. B.S.E, hoof and mouth and animal abortion diseases. Just one outbreak of B.S.E. or hoof and mouth would totally ruin our operation as well as many of my neighbors. We all wonder what our governments [sic] response would be! Would there be an equitable solution to the financial assets we have invested in meat production?” **352 Moffat**

“Environmental & Government involvement [sic] has almost made it imposible [sic] to ranch.” **598 Routt**

“There seems to be wide variation in the term “riparian” depending on which gov’t agency wants to use the ground.

“Endangered species” seems to be a political designation. Re. Local sharp tail grouse studies. Ag land is being taken by state industrial recreation lists using monies set aside for ag land & open space. Ie. The legacy project.

In Colorado there seems to be a push to denigrate ag use to promote tourism.

Property rights are being taken from ranches under false navigability issues. (River users on private reaches of rivers” **477 Routt**

“Since this property is neither a ‘ranch’ or ‘farm’ or a ‘business’ I do not feel obliged to fill out this questionnaire [sic]–

The property is a ‘homestead’ in the family since 1920s – Sagebrush, sand – cactus!!!

Eventually, it will be part of the Division of Wildlife Refuge. **57 no response**

“Being in the CRP makes us different than full time operating ranch/farms. We do upkeep our fences & monitor [sic] our springs. We are attempting to plant trees & bushes to provide some habitat for wildlife. Mainly we enjoy the open space privacy & keeping it in the family. As we don’t truly have crops & no livestock I don’t know if we really qualify as “operators!” **316 Moffat**

“If young people have lots of money and enjoy it, go for it, if they don’t, even if they get a government loan of some kind and income doesn’t improve they shouldn’t start. They will lose the most productive years of thier [sic] life trying to make a living, buying machinery fuel and so on. If they have to leave the farm at when they are 50 years old they will be lucky to find a

job they can make a living with. I was lucky I think to have some non-farmer from out of state want one place I had. But it has some good points, while you are out at the farm can think anything you want to and no one to argue with you.” **318 Moffat**

“Do [sic] to the free trade agreements with other countries it makes it hard to compete with slave labor in these other countries.” **600 Routt**

[typed comments] “No one knows just how long small family farms will continue. They sure are not profitable. But they may be the only safe cheap [sic] food producers. America has been blessed with cheap [sic] food.

I see no way for it to continue very much longer with world population soaring.

The U.S. sold it’s [sic] control over property to the homesteaders, they sold or gave their rights and control to the next generations of farmers and land owners. No one should ask for the land or rights back they should be purchased.

The government offices overseeing BLM, State Land, and Federal Land have leased their land in present and past. The damage from weed infestation and miss-use [sic] have caused my land to become weed infested. Local weeds from local livestock are bad enough. But they were here and still are. But when it became to [sic] expensive for local livestock to pay for the fees. Big sheep and livestock operators brought in weeds from other areas and states, if not countries. Now we all have a hell of a problem! Birds, elk, deer, seep, cattle, humans and water, spread the seeds. As of yet the only precaution, is to use weed free certified hay for horses on the forest land. A billion sheep can come from anywhere and carry the weed seeds in their wool and digestive systems onto the range. To my knowledge there is no weed control measures in use on forest land. But I and you want them controlled on my land.

Grazing on public land should be used if it will improve on existing conditions of the land and water. Not to help agriculture. Fees should be used to preserve and maintain the land. “Game and Fish” revenues [sic] should be used to clean up the weeds on public and privat [sic] land. DWO budgets should be taken over by the local governments, until this is done!!!

U.S. people need only think of where cheap [sic] clean food will come from, and who has been a good stuart [sic] of land and water. I will for now.” **119 Routt**

[Comments contained within the body of the survey]

A10 restrict livestock access to riparian areas: “none of any outside 3rd party’s business. I pay the mortgages & the taxes.”

B1 grazing fees: “don’t use BLM – the rates should be equal to private land leases.”

B4 public access through private land: “If I paid for the private land, then the public can pay me, just as I paid first. Nothing is free.”

B7 community you identify with: “Steamboat residents only identify with 80477. Get real. Why ask that Q?”

C1 Natural resources belong to society and C2 take society values into account: “that Q is repugnant.”

C5 required to do without compensation: “This section reflect a “nature Conservancy” personnel attitude. The view and attitude is of those who own no land because they never invested in land.”

C5 protect water quality: “If oil, then I agree, if cow manure – then this Q is bull.

Provide access to you land for hunting of native species -10

Protect habitat for threatened and endangered species -100

- C8 *federal agencies are sensitive to the concerns of local ranchers: "Used to be. Now its just access and environmental."*
Local Federal agents adequately understand local issues and conditions, but can't communicate to national because national has an environmental agenda
Environmental groups are sensitive to concerns of local ranchers -20
Permitees pay, recreationists don't all users should pay full costs. All the time.
Charge full bore for BLM/USFS grazing; should charge for hunting, should charge for dune buggy driving in the desert. If I have to pay full bore then all the other crying, complaining users (public or private) should also pay"
Private landowners would more willingly accept decisions about public land use if land managers seriously considered their concerns.
Agencies should not be able to change grazing permits without input agreement from the permittees. BLM should no subsidizing ranching, or recreation. Pay or get out.
- C9 *Decisions about the use and management of Federal lands should be made exclusively by the agencies assigned to administer them. That Q is so biased, it pathetic.*
Remember, higher mgt. has a political agenda. Its environmental.
The management authority for Federal lands should be handed over to state government -100
The management authority for Federal lands should be handed over to county government -50
The management authority for Federal lands should be handed over to associations of grazing permittees -100
Federal lands should be privatized through public auctions -100
Federal lands should be managed through coordinated resource management planning (CRMP) that involves all interested parties a sad commentary, but the most likely solution.
- D1 *Persistent drought resulting in low production – strictly agriculturally*
- D4 *Existing endangered species habitat regulations*
Due to greater restrictions on predator control dropped sheep
USDA Conservation Reserve Program (CRP) unfairly restricts trade. I don't like it.
- E2 *What is your gender mom& pop operation*
- E5 *Since age 18, how many years of ranching or farming experience do you have since birth*

"Comments:

1. Agricultural ranching in the mountains with recreational – i.e. hunting, fishing – influence will NEVER pay. The land costs are too high. If the "true" ranchers want to *cant read, may be' run livestock'* – go to NB, or OKLA, N TX where land is cheap & prod. cost is low.
2. This report seems geared to advance the agendas [sic] of the Mo. Co. _____ to protect their grazing permits. That's unfair use of a public forum.
3. All grazing permits here – nationally – should pay fair mkt prices. If they can't pay the price, fair market price – then get out.
4. No agricultural ranch/farm these days would exist w/out subsidies – That is also unfair. CRP & disaster & so on. Be fair. Drop the programs.
5. Stay off my land. I paid for it. If others want to fish or hunt, pay me. I struggled to pay the mortgage 1st. These recreationalists make no investment, no sacrifice. They just have big, complaining mouths.

Jim & Kathy Ross" 294 Moffat

"We need more farm raised employees in BLM + Forest service – They should get preference points on hiring by the Feds." **400 Moffat**

"We are impacted big time because of the value put on the land through big Money sales. No way can you pay \$10,000 an acre for Agriculture use. Inheritance [sic] tax is also bad for the future of Agriculture – land must be sold to pay tax. The cost of supplies has gotten so high and the \$ you get for commodities has decreased over the last 20 years. Conservation Easements [sic] are good way to help keep families involved and on the land. They are not just for environment purposes. More money should be made available [sic] for purchases of these." **437 Routt**

Included pamphlets on egg production, factory farms and a newspaper clipping.

"I read recently that Corporation Farming + Ranching + Factory Farms are the most glaring examples of Corporate Greed and the power of Special Interest money and are the biggest threats to Family Types agricultures.

It went on to say that if more Senators and Law makers had the Backbone of Senator Robert Kennedy and a few others that something could and should be done about it.

Am enclosing some information about Corporation + Factory Farming. I hope you will read it and use your influence to do something about it.

It looks like we need more laws like the State of Nebraska has." **661 Routt**

"Our biggest problem is our health + age. + trying to find help we can afford that will be reliable + long term. Our family all have jobs that they can not afford to quit + run the ranch. Insurance is a big factor.

Below hay production also figures in.

Propane cost are too high.

Older building need insulation etc."

B7 *my county is a friendly place to live* not like it used to be

C6 *protect habitat for threatened and endangered species* would rather not have any

C8 – *Since grazing permittees pay to use public land while recreationists usually don't, permittees should have a greater say in the use of public land.* No. Just don't cut grazing off.

C9 – *Federal land should be privatized through public auctions.* NO

D2 – *Declining financial ability of younger generations to take over farm or ranch operations.* VERY

D2 – *Declining interest among younger generations in ranching or farming as a way of life.* Just can't afford to.

D4 – *Clean water and effluent discharge regulations.* Coming.

D5 – *Uncompensated forced early removal of livestock from public land has increased your operating cost.* Hasn't happened.

D5 – *At public meetings to address conflicts over public land use, ranchers' and farmers' concerns are usually weighed equally with those of other interests.* Not anymore.

E6 – *More than one generation* 5, not all grown up yet.

F7 – added in: Expenses \$178,560. Why was this question not asked? Farm net loss - \$59,415. **681 Routt**

"Increased property taxes, high cost of equipment, equipment maintenance, increased costs of livestock care make ranching life impossible. Net profit gets smaller + smaller. The general public is not willing to pay higher prices for our products.

Ranching was a way of life, but we cannot make a living at it anymore." **539 Routt**

"We are a dieing breed. No young generation can buy + sustain life here as we have known it in todays market of land prices + livestock revenue or both crop + livestock revenue. Even with recreation value it is hard or would be hard for younger person to make a living + pay for the land without supplemental income or have inherited the money or assets to pay out in cash investment. Then it might – CASH FLOW! If careful managers." **251 Moffat**

"Ranchers in Routt Co. should be placed on the Endangered species list, even though it would not prevent their demise. Their only altenative [sic] is to sell and run, a plass 3 for developers, and absentee hoby [sic] farmers. I for one, am sick of supporting the Nation and the world, by producing products for nothing, and paying costs of production by borrowing on reserve assets." **525 no response**

"[Under Section B – Future Plans] "We are suspending the Farm/Ranch operation and moving to a smaller parcel. Reasons: 1. loss of lease, 2. low prices, 3. encroaching subdivision. [Comments section] The amount of investment in time and money to maintain this lifestyle in Routt County is incredible. The public wants to view and drive thru this atmosphere, but they don't want to help support it." **425 Routt**

"We try very hard to work with the public. We live close to town and most of our land is in the public eye. They have no clue to what it take to operate and maintain the land. All they are concerned with is how they can use our land. We do allow most people in the area Free use of our property for fishing and some hunting. But it is never enough they trespass and destroy our property.

We like the fact that a person can take their kid fishing but more and more they abuse the rights. We try to remember that a few bad apples ruin the whole basket. So far we still allow fishing and hunting, picnicking, hiking. But because we say so. The moment we are told we have too, it will stop." **No #**

"My main frustration is with the economics of the livestock operation. There is just too much work for the meager return or profit, if any.

Ranch life and livestock is a healthy, robust lifestyle with much enjoyment and satisfaction from being stewarts of the land and caretakers of nature's creatures.

But the economic struggle is discouraging, frustrating, and wears you down. At some point theres no more point in going on." **499 Routt**

"I am frustrated that I provide no compensation for damages, shelter, feed, and water for elk but have no input as to how to manage the #'s in the resident herd. I make a good income off elk hunting, but have to decrease cow #'s grazing.

Death taxes – huge liability to passing farm on to next generation. I'm trying to pass some land to next generation through FLP (Family Limited Partnership) but next generation will still have a tax liability. All I can do is "damage control" I have also spent 8500.00 so far to set it up and am still not done with the lengthy process." **552 Routt**

"Ranching is and has been for a long time a way to live/occupy your time while the land increases in value. You can make a marginal profit but its really a form of land speculation. And a way of life." **431 Routt**

"The increased value for ranch land by "high rollers" has all but eliminated any opportunity to expand operations or allow any young person to enter the ranching business. Also, the high price of farmland on the Front Range is affecting land values in several states because those

people bid the price of land above what adjacent land owners can afford to pay. It appears that only the “rich” can afford to purchase land in the foreseeable future. Also county taxes continue to increase; even though production and income on family operations decline.” **423 Routt**

“It is more difficult to make a living on the ranch or farm now. We supplant [sic] our income by the hunting program. Hopefully the hunting program will continue.” **262 Routt**

“I do own the ranchland, but have had it leased out to another farmer for the past eleven years. There are so many questions I would not know for sure how to answer will leave it to ones farming. Do hope times get better for farmers and ranchers.

As long as the prices are so low and so many rules can see why things are going bad. Guess we can expect to eat what ever is imported some day completely, then we can wonder whats been put in it or on it.

My husband farmed for 65 years and did good. He always said when government took over it would be bad, and no two places are the same or can be farmed the same. He believed land owners should just figure out how to make a go of what he had by taking care of the land.” **175 no response**

“Utah resident – purchased Colorado property for investment, run 25 cattle for a hobby mostly.

USDA employee – wife

Contractor – self employed husband” **325 Moffat**

“ I lease the farm out for wheat farming. It is dry land farming which averages about 18 bu per acre. The land cannot be farmed at a profit at this price.” **177 Moffat**

“I think all forms of Government: City-County-State and federal are wanting to run everything for all citizens. It has become “mind boggling”. Enough is enough.” **395 Moffat**

[Comments inside survey]

B2 sell land for puposes other than agriculture easement conservancy

“The community of the Steamboat Springs area, both population and increased building is greatly expanding. How to control seems to be beyond the community, though they are concerned. Probably exception are realators and developers. Money will win out in the end! It has for the last 30 years!

Also, the ranches are being bought by “want to be” cowboys. The county extension office is working to educate them on the ways of ranching along with livestock growers and land owners. Some with lots of money pay little or no attention and go ahead and do what they want. Strange things to happen. You wonder how this land and livestock survive.” **645 Routt**

“Skyrocketing land prices prohibit expansion of farms and ranches, decrease the ability to transfer land from one generation to the next and increase the incentive to sell existing land for profit.

The disparity of wages and “work week” between agriculture and non agriculture increases incentive to “see out.” Trade off used to be quality and pace of life. Recent urbanization and recreational activity of once rural areas diminished rural character.

Tourism levels have reduced mountain ranches to spectator events with little \$ return to ranchers.” **433 Routt**

“High transportation rates (truck & railroad) are an extreme hardship on farms & ranches in NW Colo. High (above Colo ave.) fuel costs are also a hardship.” **219 Moffat**

“Pg. 6#B4. Access to public ground through private ground should be allowed with permission + controls.

Pg 9#C5. We do not like the language “Required to do” and have mostly marked it negatively, although we do these things voluntarily.

Pg 9#C6. Our negative responses again relate to the phrase “Required to do”.

Pg 10 #C7. We did not respond as we try to do this and it is voluntary and has nothing to do with compensation. The two words “voluntary” and “compensation” do not go together.

Please note: Damage from wildlife, elk, deer and antelope, is steadily increasing, making it almost impossible for us to get a crop. The problem is compounded by the SIZE of the herds (probably from 75-100 times the size of the herds when we started farming). There were no elk, some deer, + no antelope at that time. The herds have been allowed to get too big. Also I think that so much land being in CRP has affected us because the animals obviously prefer the lush, green growing crops.” **244 Moffat**

“This ranch is in 4 counties and two states [Carbon, Sweetwater, Routt, and Moffat – WY and CO] and only a small portion in Routt County.

Natural resources are too valuable to be administered generically as presently is the practice by the federal agency.

Sites-specific administration should be used according to ecological configuration of the natural resource area. This should include local and private persons which are affected by the rules and regulations.

The Nat’l Forest Act has in its purpose clause the charge to increase the health of the Nat’l forests and to stabilize the economic viability of the dependent community. This seems to be overlooked or disregarded by the present administration – especially that portion referring to economic stability of the community.”

A9 – livestock also includes 3 mules and a llama.

B4 – *public should have access to public land through private* with permission ok. **299 no response**

“The effects of growth in a resort area are multi-faceted. Everything from more dogs running around to unaware neighbors to increase cost of labor (if you can find any at all – we can’t compete with \$20/hr. carpenters). That being said – I still meet and know way more folks who try to appreciate our way of life than those who think we should just go away. I have many good friends in the Steamboat area that are not involved in agriculture and the money that comes into the school district provides a great education for my children – as well as exposing them to all the different aspects of life.

The only criticism I have of this survey are that some of the questions are too broad. Some environmental groups are good to work with – some are not. Etc.”

On question B6 – I have a good working relationship with the extension agents in my community, respondent wrote +5 **429 Routt**

A2 “I own this ranch and make all the decisions.”

“the price of land is the main reason most ranches can stay in business. Most ranch loans are propped up by the equity in the land. With the small margin between profit and loss, there are very few ranches that show a profit on their operation. If the value of land should become depressed, as it was in the 80’s, we would again see many farm and ranch foreclosures.

The low price for grain has almost eliminated that portion of agriculture in our county. With the increase pressure from foreign markets and the CRP program I don't think this will ever be a grain producing area again. Our implement dealers and suppliers will be adversely affected. The range sheep and wool industry are all but written off. More cattle and federal range? Or no grazing on federal land? Makes it kind of hard to plan for the future, but there is a future and there are young people ready to farm and ranch if they have the chance." 9

Moffat

"We are being forced to supplement our incomes by finding a job to be able to support our small ranches.

With urban growth (which causes problems with irrigation ditches, as well as trespass), higher taxes, environmentalists, imports of beef, trespass (to the river – through the hayfields – or from the river rafters through the hay fields) and new rules + regulations (we can't burn our ditches because they are now considered wetlands) – it is very difficult to "break even" at ranching." 593 **Routt**

"I have not answered all questions. The one to whom I lease my farm pays cash rent and uses it for pasture. He also keeps up the fence and does some improvements such as reservoirs etc. so that I do not know how much money is put into it. He manages the farm entirely with my input in some instances." 88 **no response**

"The Little Snake river is rather an isolated area ran by decendents until oil and gas exploration came in. what has the greatest impact in the last few years is hunting seasons. The area has been so highly advertised the hunters are almost unbearable! – discourteous, destructive to fences and roads, demanding etc!

The other problem – two large corporations are buying up ranches wherever available for a 100 miles or more and making empires. They are closing their borders to public use." 290 **Moffat**

"If ranching is to continue to the next generation we must do away with the death tax.

Lower taxes on the REAL ranchers + more taxes on the Ego ranchers." 541 **Routt**

"Threats to farms and ranches like ours include increasing costs of inputs versus commodity prices. The inevitability of increasing property taxes, and the difficulty of obtaining adequate and reasonably priced health insurance." 554 **Routt**

"DOW should be mangmet game not taking land out of ranchers reach. BLM should managemet like finding line between public an private land and not controol burns" 314

Moffat

"I believe that the 2 big issues facing Ag people are; estate taxes: land values have increased much more than Ag prices thus forcing farm and ranches to be sold to pay estate taxes. The younger generation can not buy land and make it cash flow, so they turn to other profesions, and ag people are getting older.

The second issue is Ag Prices; our government thinks it can help us with gov. subsaties, but that only makes things worse. It doesn't help the Ag people as a whole, but seem to selp the ones that don't need the help.

I feel that the Gov. should be responsible for helping sell our products world wide: most country have a need for our food but don't have a demand, for lack of money. I believe

our foreign aid would be better served if we sent food instead of money. If we sent food in boxes with USA stamped in big print then the people would learn to like USA because we fed the pain.” **556 Routt**

“This was way long. I’ll bet you didn’t get many back.

Again, the picture on the front is pretty but doesn’t reflect livestock or crops.” **76 Moffat**

“We are going to become extinct as our children can not afford the price of land + equip to invest on own or even take over – the Ranch owner average age is becoming older each year.” **42 Moffat**

“This ranching and farming is in the dumps. Everyone else is riding on inflation and we are left behind. I paid \$62 per hour to have some work on my 86 car. I have had to pay from \$120 to \$240 for some lawyer work. We can’t get a decent price for our cattle. Barley oats and wheat prices are in the basement. The consumers sure want cheap food so they can play more. I wish many times I would of carried a lunch pail instead of beating my self to death trying to run this ranch. No body gives a dam about what a rancher or farmer does if there is food on the shelf in the grocery store. Just look at your self with all the fat salary increases retirement pay you will get how nice you have it. Just hang on it and be thank full.” **528 Routt**

“One of the most pressing financial problems we face is the escalating prices we must pay for our supplies that are needed to operate, but the prices we receive for our product does not increase or some years we get less.

The price of fuel, pasture, and hay has increased sharply the last five years, yet the price per pound of our calves has remained steady.” **529 Routt**

“In our area the single biggest threat comes first from the subdivision & development of the ag land base. It brings neighbors who don’t understand the needs of ag landowners. Working w/them & neighboring up helps but doesn’t always resolve the stress. Land values have risen so dramatically that it is impossible to expand our operation by purchasing more land. Neither can we afford to buy out off ranch family members who desire to capitalize on these inflated values. No real ranchers will buy a ranch in this area again. Why should ranchers have to provide at no cost all the values that society desires – like open space, etc. You didn’t mention purchase of development rights in your survey.” **428 Routt**

“The high cost of land is the main detriment to farming/ranching nowadays, esp. in tourist oriented counties like Routt. And it’ll probably get worse.” **465 Routt**

“I do believe the biggest threat to agriculture at this time is, consolidation of meat packers, and multinational Grain companies. The continued trend towards importation of cheap foreign commodities will continue, to put downward pressure on raw agricultural commodities.

The threat of diseases, and foreign bacteria’s infecting, cattle, grain and food products is extremely high, (if this import trend continues.)

We have seen this kind of Political and Multinational cooperation, force steel, clothing, lamb, chicken, and manufacturing production out of business, within the US. And it looks like (at this time) cattle production (mainly hamberger) is leaning in the same direction. (hold on) it will be a bumpy ride.” **435 Routt**

“Many of the questions in the survey are somewhat ambiguous, & sometimes redundant.” **281 Routt**

“Through prior generations, buildings & meadows were sold. What is left is mountain pasture. We provide grazing land for near by legitimate ranching operation.” **466 Routt**

“Some Gov – regulations on environment, water quality, endangered species have not yet had a on the ground impact in our area – but if these are implemented (water quality for one) will have a devastating affect on Agriculture.” **634 Routt**

“Our involvement with a State Land Board lease has been dramatically altered by the intervention of the Emerald Mountain Partnership. Not only has the existence of the lease been disrupted, but the longevity of the lease has been challenged. Now, with the pending swap with the BLM, no effort has been made by the Emerald Mountain Partnership to protect our lease, or to encourage our continued grazing & hunting rights with the BLM.” **555 Routt**

“Parents don’t have a big ranch to hand over – very hard to buy unless you are rich – can only lease – which is hard to find. When young people like us can’t buy, the wealthy who can need to work with us to keep land in agriculture so we can live the life we love as well as feed America & the world.” **445 Routt**

“We are a dude ranch that introduces outside people to the western lifestyle. Many of our guests return year after year to enjoy our counties natural beauty. We provide opportunities for locals to visit with our guests to explain why ranching is an important social + environmental aspect of the west. We have to be concerned with increasing population pressures.” **675 Routt**

“The small or family farms a becoming a thing of the past. You can no longer survive without outside income. The shift to large farms and foreign countries will repeatly weaken this country. If we ever become dependent on foreign countries for our food like we now are for oil our country will regret the outcome. The sheep industry is one example of what is taking place. This industry is not going to survive in the US if changes aren’t made.

In short Ag is a mess. Environmentalists will only hasten Ag fall I know this is what they are striving for I just wish some of them had to really work and make a contribution to our economy instead of trying to destroy it.” **66 Moffat**

“I feel that there should be no commercial use of public lands, and that also includes the tourist and hunting industry.” **233 Moffat**

“In the socpe of the whole picture I suppose the real threat to our operation will come within the frame of laws. New environmental, does and plan opinions of new residence that different to our culture and heritage seem to be the front runners of problems. To me though, what is the number one is the ability to pass my forty years, at this time, of hard work on to my family without them loosing the whole thing in the end. Too many friends around here are having to sell out due to the false high land prices when a generation passes on. Sad to see a Wall Street broker pay what ever to take a place away from family who have worked the land for generations, just to build a trophy home, with the blessing of the government.” **443 Routt**

“I do not run my land. I’ve lease it for the past twenty years.” **129 no response**

“CRMP – We worked with this program for 4-6 years. Everybody gave up on it because decisions made were not carried through. It just got our hopes up we felt everyone's time was wasted. If all parties would have complied with the plans that were put in place it would have definitely worked. Example: The DOW would say they would do certain things and then headquarters would say no that they didn't have the power to make these decisions.” **47 Moffat**

“Even though I have been farming and ranching 50 years with high input costs and comparatively low prices despite a farm program that isn't working at high expense to the taxpayer. The past 4 or 5 years have been very depressing. I am concerned about passing a good agriculture unit down to the next generation that won't cash flow in the present economy.

To sum it up: I am worth a \$million to someone who wants the prestige of owning a ranch but I can't buy lunch.

You can quote me!
Forrest Frentress” **515 Routt**

[personal letter from Forrest Frentress] “Dear Sirs:
I filled out a survey for you several days ago which covered the acreage I am farming plus Frentress Ranch LLLP [514]. If I filled out a survey for the LLLP it would be about the same as the previous form I filled out.

Sincerely, Forrest Frentress” **514 Routt**

“Ranchers are facing a lot of major hurdles, antigrazing on public land is only one of them. I think the majority of Americans are so far removed from Agriculture in general; they don't really know where the food they eat, clothes they wear, and other everyday products actually come from and probably don't really care as long as they can go to the market + purchase what they want.

I think we need to educate people about this, I don't exactly know how to do this or fund it.

The environmental outfits could probably teach us a lot. They appeal to the ignorant, I don't mean to be derogatory, public with scare tactics and such, asking for money to save the world. Again I think education is something we need to do.

Sorry if I rambled.” **373 Moffat**

“Our family is leasing our private land for grazing. This is best use that we can put it to as we are unable to run an economic viable ranch operation. Estate taxes are a serious concern. How do we, as a family, hold on to our land. Because we have private land, the push to eliminate public grazing helps us. We still strongly support public grazing, however.” **597 Routt**

“Surviving in agriculture long enough to benefit from inflated land prices has put us in the position of a debt free operation that does not significantly contribute to or diminish from our overall financial comfort. I still work my ass off at it, but that's probably because I don't play golf” **611 Routt**

“Thankyou for your time in performing this survey. I look forward to reviewing the results.” **604 Routt**

“People will take care of something of as great an economic value as a farm or ranch as well as the income they have permits. Though gov't just raises taxes to make up for a lack of

income, the private sector cannot always do so if the market doesn't allow for it. If I could choose to have a more Ag-friendly gov't I would do so (as in a free market) but I only have one gov't to pick. I hope it will wake up + see the value of preserving the family farm & ranch. These people care about the environment more than anyone. They develop + use water resources that benefit mankind + wildlife. They develop + use forage + feeds that benefit their livestock + wildlife. In my area deer, elk, antelope leave the natural areas to come into wheat + alfalfa fields to feed – not the other way around. They know quality food better than the so-called environmentalists. The family farmer + rancher keeps the land open, concrete + asphalt kill habitat + cause wildlife to decrease. What needs to be done is to keep, + even further, the ability of American farmers + ranchers to make a very good living. Then the above benefits for Americans + American wildlife would be guaranteed. Also it would guarantee financial security for American agriculturalists + their families.” **392 Moffat**

“To small of ranch to make a living for this area with out out side income.

Environmentalists are going to totally destroy our forests + range land by removing livestock. The build up of grasses + under growth will fuel some of the largest fires this country has ever seen

Un-controlled realetors are alimanating small game rabbits, sage grouse, frogs (haven't seen one for over 10 years) use to have thousnds in my lagoon.

When the people of Colo (east slope) voted anti-trapping law, they un wittingly sentenced most small animals to death – I'm not for government intervention – like the wild horse miss management that costs the American people million maybe even billions of dollors and totally destroying the range with over population. The American people won't allow control!” **618 Routt**

“This survey is long with many ambiguous questions. If you want to discuss any of this with us, call us. We'd like to know the results of the survey.

Dick + Mary Fisher” **506 Routt**

“I feel farmers and ranchers are true environmentalists – because if they don't take care of the land, it won't take care of them.

New regulations and other people from other parts of the country want to control lands + lock-up lands for a very small percentage of the population. These outside people don't care whose livelihood is destroyed.

People who don't live in an area should not be involved in decisions of the area.

Public lands belong to everyone. It's discriminatory to keep the hanicapped, young and elderly from using the lands for a half a dozen people who can walk 20 miles a day. Also we all pay more taxes because minerals and forests are locked up for these 6 – 20 people yearly.” **109 Moffat**

“Because of growth around us, there is no way to expand our operation. The land which surrounds us is owned by a rich individual whose wife and children are vegan. They only tolerate cattle because of the property tax needs. When they are here the cattle must be moved where they can't see them. Their ranch manager has no background in agriculture nor this region. Ranch managers of three of our counties ranches have degrees in Public relations, restaurant management, and non-profit management.

We are at the age of the average farmer or rancher (56 + 57). We're looking for ways to slow down and get out of the snow. In good conscience, we could not allow a young couple penalize themselves with such heavy debt for a lifestyle.” **659 Routt**

“A-10 all items will be ‘used’ starting ‘02” **602 Routt**

“We get 1960’s prices for 2002 crops” **508 Routt**

“Those who use the ‘land’ in their ads to draw tourism should pay into a fund to be used for low interest loans to aid ag longevity + viability (especially where impacted negatively by such tourism).

Peg taxes at rate when purchase + increase by cost of living only – Unfair to double + triple because of outside forces (tourism/trophy homes/etc.) – drives true family operations out + forces sales or development when wouldn’t ordinarily.” **462 Routt**

“Long term land values are more important than annual incomes from ag operations. Ranching improves the land through good stewardship and long term planning.

Thank you for your interest!” **687 Routt**

“Our dry farm is inactive except for small portion in CRP” **50 no response**

“A major problem are decisions being made by pressure from groups populated areas – people with no feelings of being an actual land owner. They just jump on the band wagon and claim to be environmentalists.” **308 Routt**

“It is very difficult to get funding for a small acreage (ranch) for a single geriatric owner in spite of knowledge and experience in ranching” **617 Routt**

“There is really only one problem that affects all the aspects of ranching and that is that a normal person cannot go out and buy working ag land property and make payments by operating that piece of land as a fulltime endeavor.

If a person could do so, then a person could make decisions based on what is right for the land, society, and the environment not based entirely on ‘making the payments.’ Most all land owners realize the value of reinvesting in land improvements but ‘til the land is paid for, that is not a viable option or priority.

Ag land is on the decline.

I challenge you all to solve the problem of start up.

Put yourself in a scenario where it would be possible to pay for ag land by operating the land and ask yourselves the questions inside this packet. See how many situations it resolves? In realistic terms, leasing – whether private or public ground, only delays the inevitable. That’s what CSU needs to resolve.

Margaret Kinnett” **182 Moffat**

“Not only are we as a family ranching operation facing severe drought, low prices, higher production costs, we now are in the process of fighting a major housing development next to our ranch. Unfortunately, the developers have money to do what they need to in order to proceed with their plans, and as struggling ranchers we don’t, so the outcome is likely to not be in our favor, and as such may be “the straw that broke the camels back.” It’s very unfortunate because my children are the 5th generation on the ranch + have worked very hard at developing a fine herd of registered cattle + would very much like to continue in the business. We are willing to work thru issues, such as weather conditions + low prices, but when it comes to going up against money people, it is discouraging. However, we intend to persevere and continue to fight the people who are against us. We have God on our side!” **125 Moffat**

“new people buying very high dollar ranches + farms want to be recognized as being in agriculture yet they don’t have to make money on the operation – thus they compete very negatively with the honest family ranch or farm” **573 Routt**

“small family operation development on recreation” **391 Moffat**

“I live in Texas only come to farm once or twice a year. My brother run an take care of ranch + farm. He lives in Craig CO.
these answers is more how I feel about the operation off farm” **221 Moffat**

“We lease for grazing. We do not have a ranch. We spend our summers on the property – travel in the winter. Both retired” **639 Routt**

“Some of your Q’s needed reworking to understand more clearly” **509 Routt**

“William L. Allen is deceased 1998 the renter takes care of the property” **3 no response**

“Jerry, Judy, and Mabel Green received 3 of these originally. We filled one out and returned it as we are one ranching operation. I am sure you didn’t want us filling out 3 of them with the same answers. I am returning this one + Mabel also received another one and she is not filling hers out as that would be a duplicate which I am sure you don’t want the survey to have duplicates. Please don’t send the reminder cards as that is wasteful. Thanks, Jerry” **133 no response**

“The property I own is an old inherited homestead. It has been leased off + on for wheat. But now is fallow – It’s just there!” **4 no response**

“We live in Pine Colorado. The Craig ranch has been used for grazing + outfitting for the last 25 yrs. We declined ranchers grazing rights in the year 2000. We have, as of last year started to dry land farm wheat + alfalfa. Hope to bring ranch back around to agricultural. Neighbor is doing plowing + planting.” **137**

“I am sorry not to complete form, but these kinds of questions just drive me bananas!!” **601**

“Even though I am a rancher w/an outside job (including wife). I felt this survey was started towards agriculture. Although I appreciate that – I think any of my friends that are not ag. oriented would answer the questions differently. Its back to the age old statement - - the “independence” which ranchers/farmers pride themselves of – will be the same “independence” that will bring them down! **309 Moffat**

“We don’t do it for the money but we need the money to keep doing it.” **86 Moffat**

“We only have about 320ac in Colo, and pasture it for about a month in the spring. Our main ranch is in Wyo.” **64 no response**

“Sub-divisions in agricultural areas should be obligated to perimeter fence maintenance.” **678 Routt**

“To get a good picture of agriculture in the west and what’s happening to it subscribe to Range Magazine!” **561 Routt**

“5 years ago, I was living on my farm with my 3 children, did not owe Any money on anything, and had over \$20,000 in the bank. Unfortunately, I became involved with a foreman from a large “tax writeoff” type of farm. He became abusive, and I tried to break it off. He slashed my tire on the county road at night, in trying to get away from him, I struck his vehicle door, which in turn struck him. I was charged with 2nd degree assault and 2nd degree attempted murder. He was charged with violating a restraining order, which was settled out of court, along with a 3rd degree assault charge while I sat in jail. I was court ordered not to live or even go to my house. My hay rotted in the stacks, and we had to slaughter all of my animals. It was drug out for over a year. I was found not guilty, but with legal fees and the cost of just getting by and raising kids has put me to far in debt to live at my place. I may still wind up loosing it, but not because of agricultural laws – just stupid male C.P. in Moffat County. I hope I can get back there before my youngest child grows up and leaves.” **284 Moffat**

“We are in an area of population and it could be dangerous to allow just anybody to hunt. A major problem are decisions being made by pressure from groups populated areas – people with no feelings of being an actual land owner. They just jump on the band wagon and claim to be environmentalists” **308 Routt**

[comments interspersed with questions] “Lake Catamount Developers, a game preserve. Wild life preserve, No concern as specified... game preserve” **630 Routt**

“We are over 75 years old and have dropped most social and school activities. We raised two children and were involved in most of the above [E8].” **498 Routt**

“Our local [extension] agent walks on water.” **627 Routt**

[these comments are spread throughout the survey]

re:

B4 – Public lands should be open for recreational uses with limitations: “only with public access right of way.”

B4 – the public should have access to public land through private land: “hell no.”

B5 – local environmental groups are good to work with: “absolutely no”

B5 – ranchers are good environmentalists: “very best”

B5 – environmental groups are knowledgeable about ranching and its effect on the environment: “what a joke”

C1 – my landowner rights include the *absolute right* to do whatever I want with my land without regard for what others prefer: “poor question”

C1 – my land owner rights allow me to do anything with my land so long as my actions *do not conflict with the interests and values of the local community*: “poor question”

C2 – my landowner rights should obligate me to *leave the land in better shape* than when I acquired it: “absolutely that’s God’s way”

C5 – provide access to your land for hunting of native species: “as a business”

C5 – protect habitat for threatened and endangered species: “but not forced to do it”

C9 – the management authority for Federal lands should be handed over to *state government*: “could be run better”

C9 – Federal lands should be managed through *coordinated resource management planning* (CRMP) that involves all interested parties: “except tree huggers”

D1 – increasing competition from foreign markets: “not necessary”
D2 – increased public debate and controversy over the grazing of livestock on public lands: “use it or lose it”
D4 – endangered species habitat regulations: “non predators”
D4 – greater restrictions on predator control: “too lax”
D4 – state sponsored private wildlife management programs: ranching for wildlife is wrong!”
No number

“Retired – questions do not apply” **403 no response**

[in survey wrt C5 What should you be required to do without any compensation] How with what? If it helps the environment should not the public help, with our income how can we do it by ourselves?” **389 Moffat**

[in survey wrt C2, responsibilities should obligate me to take into account values of society] “Only if they have any brains. [C5 – wrt wetlands] in who’s opinion” **598 Routt**

We feel you are asking to many personal questions and for information that doesn’t concern you. So we aren’t filling out the survey. **532 no response**

“We respectfully decline to answer” **654 no response**

Page 9 C3 “To what extent do you think that well-defined property rights promote each of the following outcomes in society” respondent wrote “whose definition.”

“My husband passed away at age 60 July 23, 2002. We sold all our cattle in May + I am selling our interest in a farm in order to pay medical expenses.

Each of my grown children are now holding down 2 jobs and have very little time to devote to the farm + ranch.

I will try to hold on to our mountain pasture for now and buy cattle or lease for grazing but our family is probably on the way out of Ranching + Farming.

My husband + I leased land + ran ahead of “development” for 30 years. **533 Routt**

“These questions do not pertain to us. We only rent pasture + hunting rights. **31 Moffat**

Almost all Farms & Ranches in Moffat Co. require at least 1 member of the family to work in town just to provide health insurance for the rest of the family. Part time work provides most recreation funds for the family. Some families participate in the farmers market summer program to also pay for recreation and dining out activities. I do _____ lessons and mechanic chores to help my family during the winter months.

Thanks **320 Moffat**

This ranch was included in my response about 6 weeks ago. Fred Wolf 970.879.8671 **521**

We DID return this to you. Thank you for the opportunity to give our input. We marked out our number as you said the questionnaire was anonymous. Thanks! **52**

CRP encourages landowners to leave land unused when they would otherwise lease it as pasture to local ranchers!

Also Ranching for wildlife seems to be a rich man’s game. Unfair to local hunters who hunt for meat not trophies. **239 other**

I didn't receive 1st copy and this was buried in magazine rack Sorry 127

There seems to be no voice from grazing ranches on wildlife issues nor does the Co. D. of W. listen to trespass problems, poaching or other problems.

It would seem that grazing ranchers should be the best issue of knowledge about game animals and should be heard by the County, State of D. of W., even before sportsmen's groups, etc.

176 Moffat

We have a family partnership that is 51% I + my wife 49% my son + his wife all financial answers were for me only, others for ranch as a whole. **388 other**

I do all the ranch maintainance weed control. I think all farmers shoold be forced to spray there Canadian thissel and white top patches I'n there fields. There should something done with farmers that wont spray noxious weeds. Clarence Taylor, Michael Taylor **351 Moffat**

I am a self employed Artist. It supplements our ranch income. **692 Routt**

There is five owners in our farm, with only one of the five, living on the farm. Which he raises his own livestock for his only income/profit. The only profit that we receive off the farm is from the crop sells. **61 Moffat**

I lease the grazing permit, to other ranchers. I live on the ranch 6-7 months out of the year. **382 Moffat**

1. Sell hunting rights.
2. Do not have sheep or cattle
3. Sell hay
4. Sell pasture
5. Hire hay put up
6. Do not sell fall pasture on hay meadow. Use the fall growth for the next years' fertilizer.
7. Do not use Commercial fertilizer. **478 Routt**

I believe that my education, experience and interest have brought me to a point where I would like to expand my operation. However, current real estate prices in my area make it impossible to purchase land to expand my production. The recent changes in land ownership have brought in some new owners whose interests make it more difficult to acquire leases or production (hay) or shares which realistically fit into an agricultural production program. Some new land owners do not understand how important timing is for irrigation, grazing management and weed control. They also have a difficult time understanding how ag. production must be planned through the four seasons and no decided on the spur of the moment. **434 Routt**

We lease our ranch out to Bobby George + Marieta Nelson. So we don't have any livestock or machinery. **547 no response**

[in a letter received prior to getting their survey back] Our County Commissioners are very reluctant to support the county extension services you offer – why I don't know but we need your services very badly – we are 30 years behind in education in this area compared to the east slope. I'm third generation in Agriculture and have seen the difference. Cooperative

extension must not be a phrase the commissioners don't like hearing. You can sure tell them just what Lynn Brown said – it's nothing new to them.

Thank you for you efforts we need help.

Lynn Oct-29-2002

[from the survey]

A5 – “primary activity” they checked mixed crop and added “don't have wild life operation but they eat my hay fields”

A8 – “did you raise crops” checked no and added “didn't have any drought”

B6 – extension questions, added “our extension office has not been very very good after loosing Haslem.

“We are about 30 years behind in our area for getting information about all the ideas and changes in production.

Doesn't make any difference if it is crop or animal production – for some reason we are not getting it.

Our area is hard to work because of short growing seasons and extreme temperatures. Of course the last 10 years we have been greatly dryer every year. Still operators own pasture and I'm not seeing any changes in tillage practices – I guess because of a special group are receiving government assistance.

My view point is that my 200 acre operation is my provider – and is important as some one elses 10 thousand acres. **34 Moffat**

A2 – “How would you describe your role?” wrote this is not a ranch or farm, it is mountain property all natural, we do pasture or horses in the summer months”

“This is mt. Property, we pasture our horses in the summer months. It has a cabin we spend at much time as we can there. This 180 acres was not sold with the other acres and it has been in my family for 3 generations.” **81 Moffat**

Thanks! **560 other**

Farm prices for grain, etc. are almost no higher than in 50 years ago. – We received \$2.00 for a bu. of wheat in 1948. The cost of machinery, fuel, etc. was many times less than now. Extra labor during harvest was possible to find. Now it is difficult to find and even young people want high wages. **553 Routt**

I don't believe you will ever understand ranchers like us! **523 Routt**

Lease 320 A for grazing. No income on 26A **124 Moffat**

We have been working for the last 10 years rebuilding a cattle ranching operation, after the ranch had been allowed to run down after 20 years of pasture leasing, after my dad retired. Since my Dad's passing in 1999, I am going to have to put the ranch in some kind of conservation easement to pay off estate taxes, since the land value in Routt County has skyrocketed in the past 15 years due to population growth. Alternatively, the land would have to be divided/sold to pay the *&^%\$# Government. **564 Routt**

The general public perceives farmers and ranchers in America as not being competitive enough to stay in business. – most people (non-agricultural) I talk to simply state – if somebody else can raise this stuff cheaper – somewhere else in the world why would we pay you more! Supply + demand. Most feel all ag products can be imported. We – here – particularly the west slope of Colo. Are considered by most to be fortunate “just to own the

land – even if we cannot produce agri. Products profitably. I truly believe that wildlife is our “main” product today – here in Western Co. Value of land, open space, public opinion + other factors have changed the way we do business here. – When land was cheap – commodity prices comparably higher – the economics worked in Western Colo. I don’t think that will ever be the case again! **56 Moffat**

You cannot make a living by ranching. There has to be an income out side of the ranching to just survive + pay the increasing feed, fuel etc. bills. **83 Moffat**

We prefer to not fill out questionnaires. Please take us off this list. **243**

Ranching has been my way of life and since both myself and my husband have become disabled we are passing it on to our children and grandchildren.

We hope they will be able to keep ranching. They all have jobs off the ranch. **168 Moffat**

“Not 100 acres in Colorado. We live and ranch in Wyoming” [so they checked no and did not complete the survey] **216**

Covers 3 counties, Carbon, Routt Moffat. Rather than numbers, respondent uses words e.g. for how many of the following livestock put “varies” or “primarily sheep” **298 other**

A1: ranch in Moffat, Boulder, Washington, and Larimer Counties

A9: *How many of each of the following livestock?* Horses. Pasture utilized for large dude ranch operation. **329 no response**

“Routt County is making too many laws and regulations that have a very negative impact on our operation. Most of the people making the regulations, are city people that are new to the area. I think the building department is the worst of these regulators.” **544 Routt**

N = 138