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LEARNING AND APPLICATION OF RANGE MANAGEMENT INNOVATIONS
AMONG RANCHERS IN WEST-CENTRAL COLORADO

by

Caroline A. Kennedy

A thesis submitted in partial fulfillment
of the requirements for the degree

of

MASTER OF SCIENCE

in

Range Science

UTAH STATE UNIVERSITY
Logan, Utah
2005

ABSTRACT

Learning and Application of Range Management Innovations
Among Ranchers in West-Central Colorado

by

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Utah State University, 2005

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Department: Forest, Range, and Wildlife Sciences

Like many ranchers in the West, ranchers in West-Central Colorado are reevaluating their management strategies in the face of forces like drought, rising land prices, and encroaching development. While ranchers seek answers on alternative management strategies, research and Extension personnel search for adequate means of diffusing needed information. Relative to many rural western communities, ranchers in West-Central Colorado show high interest in alternative range management ideas, and many implement changes to their ranch management based on these ideas. This can partially be attributed to a unique support system of Extension and agency personnel with effective, untraditional outreach and land-management approaches. A survey was mailed to all 647 persons on the mailing list for the CSU Tri-River Extension Office, including Forest Service and BLM permittees in Mesa, Delta Montrose, San Miguel, Ouray, Hinsdale, Saguache, and Gunnison counties. The survey was designed to gain insight on

how ranchers perceive current Extension efforts, how they learn new management information from peers and Extension/agency personnel, and how they apply these new ideas to their operations. Subsequent qualitative interviews with respondents gathered information on the process of adapting and implementing range management innovations into individual operations. This paper presents the findings of the survey and interviews, and implications for future outreach efforts.

(113 pages)

**For my husband and family, who bless me with courage, hope, and laughter;
one day at a time.**

*God, grant me serenity to accept the things I cannot change, courage to change
the things I can, and wisdom to know the difference, living one day at a time, enjoying
one moment at a time, accepting hardship as a pathway to peace...*

~ Francis of Assisi

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Caroline A. Kennedy

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CHAPTER 1

INTRODUCTION

In much of the western United States, ranchers are reevaluating their management strategies in the face of forces like price instability and drought, as well as unpredictable futures on federal grazing permits (LeValley et al. 2000, Rowe et al. 2001a). In the interest of a sustainable future, some ranchers find themselves shedding the hat of rugged individualist for multiple roles that include range rider, public relations specialist, and direct marketer.

Furthermore, many scientists, policy makers, and conservationists believe that the social and environmental sustainability of western rangelands requires keeping ranches intact while improving management of both public and private lands (Brown and McDonald 1995, Knight et al. 1995, Riebsame 1996, Knight et al. 2002). Research and extension personnel are seeking better ways to encourage use and dissemination of sustainable range management practices to conserve rangelands and associated ranchers' livelihoods, while ranchers are seeking out new information on the multiple roles they work to fill (LeValley et al. 2000).

All together, these forces create a climate for change in range management practices among ranchers making their living on western rangelands. In response, this study was designed to learn how ranchers apply new information about range management into practical application; in other words, how information on range management practices evolves from an extension fact sheet or workshop into practical application and integration into ranchers' operations. With information on adaptation of range management practices, research, agency, and extension professionals can have a

better understanding of their audience and perhaps tailor research and outreach in ways that ranchers can readily use.

This study focuses on ranchers in West-Central Colorado communities. Relative to other rural western communities, many ranchers in communities like Paonia, Crawford, and Delta show high interest in alternative range management ideas, and many implement changes to their ranch management based on these ideas (Bradford pers. comm. 2003). Research was done to better understand this comparatively widespread adoption and adaptation of range management strategies, with collaboration from Colorado State University Extension and land management agencies and support from the BEHAVE consortium.

The BEHAVE (Behavioral Education for Human, Animal, Vegetation & Ecosystem Management) consortium is a group of researchers from several universities and research centers working with the mission of inspiring people “to master and apply behavioral principles in managing ecosystems” (BEHAVE 2004). Their research concentrates on using behavioral principles and practices on herbivores of all kinds, from cattle to robins, to find solutions to problems people face in land management, such as weed control, riparian restoration, and wildlife damage mitigation.

BEHAVE OBJECTIVES

The BEHAVE consortium includes Utah State University, University of Arizona, University of Idaho, Colorado State University, Montana State University, USDA’s National Wildlife Research Center, as well as an advisory board of more than 50 members from diverse backgrounds and interests. Together, they aim to

increase the ability of people to use knowledge of behavior to better reconcile ecological, economic, and social facets of management by conducting outreach, education, and research activities that will: (1) improve economic viability and ecological integrity of pasture- and range-based enterprises, (2) enhance and maintain biodiversity of rangelands, (3) restore pastures and rangelands dominated by weeds, (4) optimize wildlife benefits to land owners, managers, and users, (5) mitigate livestock abuse of riparian areas, (6) improve our ability to manage complex adaptive systems. (BEHAVE 2004)

Examples of behavioral principles in practice include the realization by many, ranchers and researchers alike, that habitat selection behaviors are learned (BEHAVE 2004). Cattle can be trained to use riparian areas less and uplands more, increasing carrying capacity and mitigating damage to riparian areas. Additionally, altering the cattle's behavior can have long-term impacts. As a mother forages in uplands, her offspring also learn to use upland versus riparian habitats. This preference will likely continue in subsequent generations.

BEHAVE sees unlimited potential in application of behavioral principles to land management. Unlike common structural changes used by ranchers like fences or water developments, behavioral principles, once mastered, can be easily transferred from one situation to the next and cost relatively little to implement. The challenge to BEHAVE is helping land managers, ranchers, and agency personnel alike understand and apply behavioral principles into their everyday lives. BEHAVE seeks to engage small and mid-sized producers, land managers, extension, and technical assistance personnel in education and outreach activities that will fundamentally change the way they understand and use behavior to manage ecosystems. "We want people to realize the power of behavior to transform systems ecologically, economically, and culturally" (BEHAVE 2004).

EXTENSION AND AGENCY OBJECTIVES

Federal land management agency and extension personnel in Gunnison Basin are supportive of ranchers' interests in change. Not only do they provide information on innovations, but federal range personnel also allow flexibility in grazing permits when ranchers work to incorporate innovations into their public range management (Bradford pers. comm. 2003). The high interest and involvement in the ranching community by agency and extension personnel in West-Central Colorado seems unique and likely plays a role in the relatively high interest among area ranchers in alternative management strategies.

In addition to ideas from extension and agency personnel, ranchers in this area are exposed to numerous range management ideas through neighbors, Holistic Management programs, as well as the Range Management School for Ranchers (see Chapter 2). The Range Management School for Ranchers is well attended and has become a model for similar efforts in other areas throughout the West.

Agency and extension personnel identified information they would like to gain from this project, including specific factors that help make their outreach programs successful, why some ranchers do not participate, and what materials or other types of information would be helpful.

PURPOSE OF STUDY

The objectives of agency and extension personnel and BEHAVE were synthesized to help define the following study objectives.

1. a. Identify characteristics of ranchers and ranch enterprises that are associated with decisions to change range management practices.
- b. Identify characteristics of ranchers and ranch enterprises that are associated with decisions to attend the Range Management School for Ranchers.
2. Identify factors that assist ranchers in making successful adoptions of range management practices.

To fulfill these objectives, research was conducted in a two-stage process. The first stage involved a 4-page survey mailed to persons on a CSU extension mailing list and included inquiries into ranchers' range management, their use or nonuse of range management innovations, and sources of information for range management ideas. The results from the survey are summarized and discussed in Chapter 3.

Results from the mailed survey were used to develop themes for further questioning in qualitative interviews. This second stage of the study specifically aimed to gather information on the process of adapting and implementing range management innovations into individual operations. Interviews were transcribed and analyzed using inductive coding techniques (Strauss and Corbin 1990). These results are synthesized and discussed in Chapter 4. Chapter 5 discusses the study's findings, what it means for outreach and agencies that promote range innovations, and how these findings can direct further outreach and research efforts.

All in all, the purpose of this study was to evaluate the change-adoption process of West-Central Colorado ranchers and understand what makes ranchers more likely to adopt new practices, especially those rooted in understanding behavior of livestock.

CHAPTER 2

LITERATURE REVIEW

Habits improve efficiency, add predictability, and greatly increase the likelihood of survival in an otherwise chaotic world. But as the world changes, individuals must change or risk becoming extinct, as when herbivores only select particular foods and habits. New habits are likely to develop when an animal "satiates" on a behavior or when changes in external environments force animals to alter behavior.

~BEHAVE Project Summary, 2004

Ranching communities throughout the West are being tested in their ability to change in response to conditions like drought, increased political pressures, and rising production prices. This leaves many to ask how the ranching way of life will evolve to meet these challenges, and for university extension, whether they are providing research and outreach in ways ranchers can practically use in ever-changing situations.

Significant research has examined technology transfer in agriculture, including university extension's role in adoption-diffusion. Traditionally, adoption-diffusion research largely focused on socio-psychological theory, emphasizing situation and individual characteristics as constraints to adoption. More recently, researchers have extended adoption-diffusion research beyond the individual to social, economic, and environmental forces that play on agricultural adoption, including the effects of the researchers themselves. Following is a review of adoption-diffusion theory as well as insights into common means of technology and information transfer in agriculture.

ADOPTION-DIFFUSION

An innovation is an "idea, practice, or object that is perceived as new by an individual or other unit of adoption...If the idea seems new to the individual, it is an innovation" (p. 11, Rogers 1995). Diffusion is "the process by which an innovation is communicated through certain channels over time among the members of a social system" (p. 5, Rogers 1995).

Significant research on the diffusion of innovations indicates diffusion often follows a predictable S-shaped curve, with cumulative numbers of adopters rising slowly at first and then accelerating to a maximum as interpersonal networks spread evaluations of the innovation from peer to peer until half of the individuals in the system have adopted. The curve then gradually increases at a slower rate as fewer remaining individuals adopt the innovation.

Adopters can be categorized based on the time in the curve at which they adopt an innovation. Rogers (1995) defines five categories: innovators, early adopters, early majority, late majority, and laggards. Innovators are said to be venturesome, daring, and more likely to have social circles extending beyond the local community. Early adopters tend to be a more integrated part of the local community, generally well respected, and are the adopters most likely to influence the opinions of others in the community. The early majority adopters are the largest category of adopters, generally composing a third of the members of the system. They interact frequently with their peers and generally deliberate some time before completely adopting an innovation. They are not usually opinion leaders in the community. The late majority also makes up a third of the

members of the system. These adopters adopt new ideas after the average member of the system. They are skeptical adopters, often adopting out of economic necessity or pressure from peers. Laggards are the last to adopt an innovation, often as the result of social isolation from peers and clinging to the ways of the past. They make decisions based on what has been done previously. They often have limited resources and therefore feel that they must be sure the innovation will not fail.

Adopters work through an innovation-decision process (Rogers 1995). The individual moves from *knowledge* of the innovation to *forming an attitude* about the innovation. This attitude thus forms a *decision* to adopt or reject the innovation, then *implementation* and *confirmation* of the decision.

Knowledge

The knowledge stage occurs when the individual first learns of the innovation and gains some understanding of how it works. Often, people do not expose themselves to information about an innovation unless they have a need for that innovation (Hassinger 1959). Exposure to an innovation will have little effect unless people perceive the innovation as relevant to their needs and consistent with their beliefs and attitudes.

Forming an Attitude

At this stage, the individual actively seeks information about the innovation, begins to perceive the specific characteristics of the innovation, and favors or disfavors the innovation based on these characteristics.

Perceived characteristics of the innovation include relative advantage, compatibility, trialability, and observability. In this stage, as well as in the decision stage,

the individual seeks information from peers who have had personal experience with the innovation. Common questions asked are "What are the innovation's consequences?" and "What will its advantages and disadvantages be in my situation?" (p. 13, Rogers 1995).

Decision

The attitude formed leads to a decision to adopt or reject the innovation. Individuals will often adopt an innovation on a trial basis in order to determine how useful it is in their own situations. Innovations that can be limited to a trial basis will be adopted more readily than an innovation that must be adopted in entirety. In many cases, if the trial proves some relative advantage, the innovation is likely to be adopted.

Implementation

The individual puts the innovation into practice and is actively seeking information about where to obtain the information, how to use it, and how it works. Re-invention often occurs at the implementation stage. Re-invention is the "degree to which an innovation is changed or modified by a user in the process of its adoption and implementation" (p. 17, Rogers 1995). Re-invention is often beneficial to adopters because it encourages customization of the innovation to individual situations and changing conditions.

Confirmation

The individual may terminate the innovation-diffusion process at the implementation stage, but often they seek information after they decide to adopt. The

individual finds reinforcement for the decision made, or reverses the decision after learning conflicting ideas about the innovation.

Socio-Psychological Theory

Much of traditional adoption-diffusion concepts are based in socio-psychological theory, primarily focusing on the individual operator as the decision-maker, emphasizing individual and situational characteristics as constraints on decision-making, and concentrating on information transfer as a vehicle for stimulating change (Fliegel 1993). The traditional diffusion model sees the adopter's access to information about the innovation as the principal factor affecting the decision to adopt (Hooks et al. 1983).

Some rural sociologists argue this approach assumes that adoption of technologies is always beneficial (Goss 1979, Heffernan 1984) and that the classical diffusion model places blame on agricultural producers for failures in adoption (Goss 1979, Heffernan 1984). Traditionally, much of extension has taken primarily socio-psychological approaches, and been criticized for being out of touch with agricultural producers (Sharp 2001).

ALTERNATIVE APPROACHES

Ison and Russell examined the Australian extension system in their book, *Agricultural Extension and Rural Development* (2000). Ison and Russell concentrated their work on a research and development project with wool growers in New South Wales. They found that wool growers were critical of research because of previous bad experiences. The concerns of researchers in research and development were not the

concerns of the graziers, and most graziers knew little about the organizations and people involved. Ison and Russell described the graziers as researchers and experimenters in their own right. "New" technologies were found on farms where they had been in use for several years.

Ison and Russell characterized traditional agriculture extension programs as being "first-order" research and development. They explain first-order research as being objective and having clearly defined problems, as well as technological solutions. Also, in first-order research and development, barriers to adoption are placed on the pastoral community. They argue first-order research and development should be complemented by "second-order" research and development: work that advocates responsibility rather than objectivity, and listens to and coheres to the expressed needs of the day-to-day lives of people involved. Ison and Russell explain knowledge that leads to action is created by joint action of parties involved, i.e., dialogue between extension and the community.

Ison and Russell argue first-order or second-order research by themselves offer little reconciliation other than "my data is better than your data," or "you're wrong and I'm right," but when first-order and second-order research are used together, they complement each other and can accommodate new ways of thinking.

Similarly, Nowak (1987) says adoption-diffusion research should be built upon and complemented with other dimensions, such as economic theory. In his research on adoption of conservation technologies, he found that both economic and diffusion factors were important in adoption of conservation technologies. He also concluded that

...one cannot treat all soil and water conservation technologies as a unidimensional technology. As earlier diffusion researchers have found, the attributes of an innovation interact with the setting of the adoption to influence

subsequent adoption processes. The appropriateness of the technology to the ecological setting cannot be ignored, and an accurate assessment of the physical setting is important in understanding the adoption of agricultural technologies. (p. 216)

Jackson-Smith (2004) argues that in addition to the ecological or structural setting of agricultural change, that accurate assessments of the viability of new agricultural technologies must include an appreciation of the broader sociological dimensions of farmer and farm household decision-making, and that these sociological assessments must extend beyond traditional adoption-diffusion approaches. In his review of research on social aspects of agriculture, Jackson-Smith (2004) says "it is apparent that the simple [adoption-diffusion] approach to understanding agricultural producers' behavior with respect to natural resource management has proven to be inadequate...the nature of farmer decision-making is much more complex than often assumed" (p. 167).

UNDERSTANDING DECISION-MAKING ENVIRONMENTS

In agreement with the above conclusions, this study worked to evaluate decision-making as a complex interplay of biophysical, economic, political, and social components.

Biophysical

Ranchers face a multitude of ecological stressors to their livelihood, including blizzards, pests and predators, recurring drought, and poisonous and invasive plants. In recent years, drought has been an intense stressor on rural communities in Colorado as in much of the southwest.

Drought is defined as a prolonged period of several months or more of below average soil moisture, and a drought is considered severe when precipitation is more than 25% below normal (Bartlett et al. 1989). Drought years are almost as common as "average" years in the southwestern U.S. Drought occurred 43% of the time in the southwestern U.S. from 1944 to 1984 (Howery 1999). As of March 2003, much of Colorado was in its fourth year of drought, causing many ranchers to sell or move their cattle. In 2002, ranchers saw dramatic decreases in production, with as much as 50- to 60-pound decreases in calf gains. Forage quantity and quality was reduced in most situations because of heavy grazing and few opportunities for regrowth. CSU Extension advised ranchers to stock at no more than 50-70% of their rangeland's carrying capacity for 2004 (Roath 2003).

Economic

High competition, product price instability, and low returns to investments are characteristic of the agricultural market (Workman et al. 1972, Buttel and Swanson 1986, Workman and Evans 1993). Therefore, decision-making is largely constrained by capital resources.

Ranchers work under a commodity pricing structure which in many ways resembles the same structure "faced at the end of the trail drives in the late 1800s. For the uninitiated, commodity selling is akin to playing in a poker game where the other players control the cards and make bets for you" (p. 185, Field 2002). Prices for commodities like cattle and sheep are cyclical; yielding high prices when demand is high and the supply is low. Ranchers respond to rising prices by producing more, and

eventually the supply overwhelms the demand, causing prices to fall. Falling prices cause production to slow, and the cycle repeats itself. "Cyclical markets taken in combination with the effects of random weather conditions make it clear that ranching is a risky business at best" (p. 185, Field 2002).

Workman et al. (1972) note that even when market-wide decrease in cattle numbers would be a strategy to increase beef prices, the most rational strategy for the individual rancher is to increase his livestock numbers through profitable investments in range improvements or other means of increasing carrying capacity. Whether production increases or decreases at industry level, an individual rancher maximizes the increase or minimizes the decrease in his/her revenue by increasing herd size.

Larger operations more often readily invest in improvements because they have lower costs per unit, have greater access to new technologies, the ability to spread fixed costs over greater production levels, and better access to markets (Field 2002). Ranchers with more than 500 animals have production costs around \$85 per hundredweight of calf produced, while smaller operators with fewer than 50 head have costs of about \$125 per hundredweight of calf produced (Lamb and Brasher 1998). With their average cost per animal lower, larger ranches often invest more frequently in range improvements than smaller operators (Lacey et al. 1985).

Profitability associated with sustainable agricultural practices was the most important factor influencing adoption among Montana farmers (Saltiel et al. 1994). Adoption of conservation practices in agriculture is often dissuaded because returns to these investments are low and usually not realized for years (Swanson et al. 1986). Buttel and Swanson (1986) explained that farmers should not be expected to voluntarily

invest in conservation practices when they are constrained by scarce capital resources that can be more profitably applied to other areas of production.

Conversely, producers often do not make decisions that always make economic sense. Nowak (1987) found

...the decision process surrounding the adoption of conservation technologies have a strong economic dimension. Yet what farmers should do according to economic theory is not the same as what farmers actually do in adopting a new technology. Therefore, instead of stopping with the legitimate deduction that economics are important to the adoption of conservation practices, we must go on to the equally important task of explaining the variability among farmers in terms of their pursuing conservation objectives. (p. 218)

Nowak says "insights from sociological research on the implications of social stratification, kinship and ethnicity, community, indigenous knowledge networks, and attitude-behavior relations are virtually ignored" (p. 217).

Political

Public-lands grazing has been a subject of nation-wide debate in recent decades, bringing numerous lawsuits and fierce conflicts among environmentalists and ranchers. Almost 90% of ranchers in Tehama County, California felt that "environmentalism" was a serious threat to ranching (Huntsinger and Hopkinson 1996). Environmentalists and ranchers often share a love for rangelands, but their perceptions of those rangelands are very different. In a 1987 study of ranchers and environmentalists in Malheur, Oregon, the two groups had opposing views on grazing issues and wilderness designation. Environmentalists saw too much grazing in the county, while ranchers saw valuable rangelands being set aside as wilderness (Huntsinger and Heady 1988).

While Americans like the idea of ranching, such as the open landscapes and pioneering spirit, they are less enthusiastic about the actual practice of ranching, particularly on public lands (Brunson and Wallace 2002). Brunson and Steel (1994) conducted a survey in 1993 on U.S. attitudes toward federal rangeland management. They found that most Americans felt that livestock grazing had damaged federal lands. Sixty percent agreed with the statement that cattle and sheep had overgrazed most federal lands, and more than a third of respondents agreed that livestock grazing should be banned on federal rangelands.

Ranchers feel the pressure of opposition to their grazing of public lands, as public lands are a mainstay for many operations in the West. Ranches are often made up of a home ranch of private land as well as grazing permits on public lands to ensure an adequate forage base (Sullins et al. 2002). Eighty-five percent of public lands managed by the Forest Service and BLM are grazed, or 406,000 square miles. About 170,000 square miles of private rangeland are attached to these public grazing lands. Altogether, about 21,000 public lands ranchers use 576,000 square miles of land (Marston 2002).

Ranchers are also seeing significant changes in the political climate of their local communities. The population of Delta County increased 33% from 1990 to the year 2000, rising from 20,980 to 27,800 people (Bradford et al. 2002), with the area experiencing subdivision development like much of western Colorado. This type of development can create a loss of "critical mass" or "impermanence syndrome" among ranchers (Hart 1991, Huntsinger and Hopkinson 1996) and bring more urban attitudes that often do not feel as positive toward livestock grazing as their rural neighbors (Brunson and Wallace 2002).

Once a rangeland community loses its critical mass of ranchers, ranching may become less economically viable. As the numbers of ranchers decline, their political and economic influence also declines, and non-farm community preferences like noise ordinances and increased tax loads for suburban infrastructure gain acceptance. Additionally, land values rise to prices that cannot be paid for by agricultural use alone, making expansion difficult or impossible (Hart 1991). Impermanence syndrome among ranchers may cause them to neglect stewardship and postpone ranch improvements, in anticipation of seemingly inevitable development (Hart 1991, Huntsinger and Hopkinson 1996).

Social

In *The Tipping Point*, Malcolm Gladwell (2002) explains the power of community in decision-making. He tells of Methodism's founder, John Wesley, and his organizational genius. Wesley traveled around England and North America delivering sermons. He would stay long enough in each town to form religious societies, which he subdivided into smaller classes of about a dozen people. He was one person with ties to many groups. Gladwell explained,

Wesley realized that if you wanted to bring about a fundamental change in people's belief and behavior, a change that would persist and serve as an example to others, you needed to create a community around them, where those new beliefs could be practiced and expressed and nurtured.... It's easier to remember and appreciate something, after all, if you discuss it for two hours with your best friends" (p. 173).

Gladwell explains the lesson learned from Wesley is that "small, close-knit groups have the power to magnify the epidemic potential of a message or idea" (p. 174).

Close-knit groups, like family and friends, play key roles in adoptions.

Farming with a relative appeared to promote adoption of conservation tillage practices in Southwestern Ontario (Warriner and Moul 1992). Working with kin likely gave opportunities for scrutiny when making collective decisions and also allowed access to a larger network, providing more sources of information and receptiveness. Larger networks also create more opportunities for contact with trustworthy individuals like other farmers, as well as credible experts like financial advisors. However, the authors noted that when a farmer's social influence is chiefly made up of family members, this homogeneity resulted in smaller, tighter networks. Consequently, these smaller networks may cause more private decision-making and inhibit conservation.

Family farming operations are also households, and often adoption decisions are household decisions, not just business decisions (Gasson and Errington 1993); therefore, family characteristics can be as important as individual farmer characteristics in adoption. Bob Budd is a ranch manager for The Nature Conservancy and author of *Blue Birds and Black Cows*, an essay in the book *Ranching West of the 100th Meridian* (2002). He describes how family dynamics played in the fate of his family's ranch, a fate shared by many ranching families.

My grandfather sold it to his sons, an early inheritance more or less... Suddenly a ranch that was home and profit to one family had to be home and profit to two families. A ranch that would buy a new truck for the price of five calves had to buy two trucks, and new trucks were twelve cows each. Within a few years, a new pickup was twenty calves; nights in the calving barn were still twelve long hours. In the end, one brother became a judge, the other a Realtor and public relations specialist. They were good at what they did, they were happier. After all of the hard times, sweat and fret, they had a little money in the bank, a "stake," as the old cowboys said, and they made the most of it. The ranch was loved by a man who lived in the old family house and worked for a man who had lots of money and visited rarely. (p. 176)

INNOVATION DIFFUSION IN RANCHING

Ranching has proved unique in its operational motivations, and theories developed in other fields do not necessarily apply to ranching. Ranchers do not respond to primarily profit motivations. Grigsby (1980) suggests that ranchers know about new technologies that may be economically beneficial but do not adopt them because they would negate values of the rancher lifestyle, such as independence, self-sufficiency, and individualism.

Smith and Martin (1972) similarly indicate that economic and business theories cannot be readily applied to cattle ranching. A ranch's market price is above any rational value based on the ranch's production potential. The ranch is both a productive and consumptive unit. The ranch provides some earnings but also allows ranchers and their families a highly valued way of life.

Ranchers ranch because they like doing so, not because it is their hope to make a quick fortune. Few are the fortunes to be made.... If the business is being kept up because it is fine or fun, there is little reason to modernize and attend more to the bottom lines of profit and loss, particularly if that would impair the largest reason to continue. (p. 7)

Management Strategies

A study of Utah ranchers in the 1990s found that while permittees were concerned over losing public land access, a majority of them were not actively pursuing alternatives (Coppock and Birkenfeld 1999). Sixty-four percent of respondents were considered passive in their coping strategies. About one quarter of these either planned to turn over ranch decision-making to a family member or get out of livestock production entirely in the near future. Three quarters of the passive managers desired to be proactive in their

management but were constrained by a lack of resources. Thirty-two percent of respondents were considered proactive, using coping strategies like intensification or diversification. Most proactive ranchers planned to intensify use on their private lands. Intensification was five times more common than plans for diversification (Coppock and Birkenfeld 1999).

Similarly, diversification was not a popular management strategy among ranchers in northwestern Colorado (Rowe et al. 2001a). Diversification can often mean bringing people onto the ranch. Ranchers may perceive these activities as negating the traditional ranching lifestyle and interfering with ranch operations and are therefore reluctant to consider them. Also, many ranchers are motivated to continue ranching primarily because they enjoy animal husbandry, ranch work, and the ranching way of life (Rowe et al. 2001b); therefore, diversification may go against the very reasons ranchers continue to ranch.

Among northwest Colorado ranchers, way of life, tradition, family and place attachment were main reasons they intend to stay in agriculture (Rowe et al. 2001b). A majority of ranchers stated that if federal forage bases were limited, they would likely seek management alternatives for their operations rather than selling their ranches (Rowe et al. 2001a).

Rancher Characteristics

Didier and Brunson (2004) looked specifically at innovative ranchers in Utah and their motivations for adopting changes to their management, as well as personal and operational characteristics. Motivations for adopting changes included improving

profitability and conservation of natural resources, and ranchers interviewed often emphasized the link between the two goals.

Interviewees expressed strong lifestyle and land stewardship values that influenced their decisions to invest in improvements. In some cases ranchers invested in conservation practices even when they did not expect to recover costs associated with implementation. (p. 333, Didier and Brunson 2004)

Ranchers also innovated to demonstrate good land stewardship to the public and to improve relationships with public land management agencies. While this idea may go against traditional ranch values cited by Grigsby (1980), like avoiding government intervention and collaborative efforts, Didier and Brunson suggest that active involvement in these endeavors may be necessary today to maintain ranching lifestyles in a changing socio-political environment.

Interviewees were full-time ranchers living on the ranch and were dependent on primarily ranching income. Some ranchers noted that because they did not have to work off the ranch and did not spend time commuting to and from the ranch, they were able to spend more time on innovations (Didier and Brunson 2004).

Didier and Brunson's results reflect earlier findings by Rowan and White (1994) on Texas ranchers' use of weed and brush control. They found that ranchers who invested in weed and brush control had higher proportions of family income from livestock production and less off-ranch income.

Didier and Brunson (2004) also found that for the most part, innovative ranchers were working to sustain ranches that had been in the family for multiple generations. Didier and Brunson suggested that these ranchers were more willing to invest in long-term improvements than those who believed their ranch would be sold and subdivided

eventually.

Additionally, these ranchers had large social networks and actively sought information about range management. They also maintained frequent interaction with university extension. Didier and Brunson suggested that frequent interaction with people outside the local community allows ranchers to be more comfortable trying new things than those ranchers who are not commonly exposed to innovative ideas and people. Additionally, this contact allows them to observe the outcomes of other ranchers' practices. This is consistent with Rogers' (1995) hypothesis that people are more likely to adopt practices when they can readily observe the results, thus reducing the risk associated with making a change.

Coppock and Birkenfeld (1999) found in their study of Utah ranchers that those with larger operations, as well as higher levels of education and income were more active in their management. Peterson and Coppock (2001) found that Utah ranchers identified retirement, increasing age, deteriorating health, and economic restraints as primary reasons for passivity. Ranchers favored practices that were less complex, had predictable or controllable outcomes, were more cost-effective, and were directly compatible with production goals (Coppock and Birkenfeld 1999).

In their evaluation of the cooperative extension rangeland monitoring program in Arizona, Fernandez-Gimenez et al. (2005) found that lack of time, help, and knowledge about monitoring methods were obstacles to monitoring among most permittees. Among Texas ranchers, cost and safety were major barriers to mechanical control and prescribed fire, respectively. Increased economic returns were the primary incentives for using

weed and brush control of all types, including sheep and goats, prescribed fire, as well as chemical and mechanical control (Rowan and White 1994).

Kreuter et al. (2001) surveyed county extension agents in Texas about landowner adoption of a brush reduction program called Brush Busters. The program was becoming increasingly popular among landowners. Extension agents attributed the program's popularity to its relatively low cost, convenience, safety, predictability, and effectiveness in controlling unwanted brush. Also important to the program's success was the ready availability of user-friendly information about Brush Busters including videos, notebooks, compact disks and numerous field demonstrations. Kreuter et al. (2001) concluded that

range management technologies that can be easily understood, are inexpensive, and which have relatively rapid and predictable results are more likely to be adopted by land managers than costly or complex strategies with delayed or uncertain responses. (p. 638)

Range Management Practices

Ranchers in West-Central Colorado communities like Delta, Paonia, and Montrose are exposed to numerous range management ideas through neighbors and agency professionals, as well as the Range Management School for Ranchers. Colorado State University (CSU) Extension in 1995 brought together area representatives from the Natural Resources Conservation Service, the U.S. Forest Service, and the Bureau of Land Management to develop a range management training program for ranchers. Eighteen area ranchers interested in learning about the science and practical application of progressive range management were also involved in determining the School curriculum.

The collaboration of ranchers and agency representatives created the Range Management School for Ranchers (LeValley et al. 2000). Two courses were developed. The introductory course, Range 101, covers plant identification, how a grass plant grows, plant response to grazing, range nutrition, biological planning, range monitoring, animal behavior, range economics, range improvements, and poisonous plants. The more advanced class, Range 501, goes into more depth, including the details of designing a grazing management plan. This course includes developing aspects of the plan that federal agencies require, like carrying capacity and monitoring. Each course participant receives a class notebook that includes material from the CSU range department, pertinent articles from range journals and magazines, NRCS publications, and speakers' handouts. The cost for the class and notebook is \$15.

Since its first class in December 1995 of 62 ranchers, federal land managers, private rangeland owners, and environmentalists, the Range Management School has evolved into several well-attended classes every year and become a model for similar efforts in other areas (LeValley et al. 2000, Bradford pers. comm. 2003). Numerous range management ideas are available to many ranchers in West-Central Colorado communities with ranchers, extension, and agency personnel that actively seek new information and ideas. Just a few range management practices are briefly summarized below.

Grazing Programs. Grazing programs are designed around specific management goals and objectives and are optimally designed with animal and plant productivity, as well as economic viability, in mind. There are several rotational grazing systems, e.g., rest-rotation or short-duration grazing and variations thereof, but sustainable grazing rotations share a common foundation of managing for animal and plant productivity via

improvement or maintenance of range health. Range health is determined in part by plant responses to grazing. Plant responses to grazing are defined by frequency of defoliation, intensity of defoliation, and opportunity for regrowth. To manage for plant responses, grazing programs should be designed to reduce the potential number of times a plant is grazed in one season and to increase the opportunity for regrowth as grazing intensity increases. Overall, controlling the impacts of grazing on rangelands depends on managing the *time* and *timing* of grazing (LeValley et al. 2003).

Water Improvements. Water improvements are often put into place on rangelands to increase animal performance and manage for range health, such as more even animal dispersal and improved water quality.

Cattle in southeastern British Columbia and southwestern Alberta showed increased gains with access to clean drinking water (Willms et al. 2002). Calves with cows drinking clean water gained 9% more weight than those with cows on ponds. Yearling heifers having access to clean water gained more than 20% more weight than those on ponds. Cattle avoided water that was contaminated with 0.005% fresh manure by weight when given a choice of clean water. Additionally, cattle that had access to clean water spent more time grazing and less time resting than those that were offered water at ponds (Willms et al. 2002).

Range Monitoring. Range monitoring allows land managers to see gradual but important changes in range health that are often too subtle to notice otherwise. Range monitoring helps managers know whether they are meeting their goals and objectives for their rangeland and to perhaps defend themselves with documentation if questioned about operational effects on the environment (LeValley et al. 2003). There are several range

monitoring methods that can be used by ranchers, including the grazing response index and photo monitoring.

The grazing response index, or GRI, is used to assess the frequency and intensity of grazing and the opportunity for regrowth. Frequency is the number of times a plant is defoliated during the growing season. A value of +1 is given for one defoliation, 0 for two defoliations, and -1 for three or more defoliations during the growing season. Intensity is the amount of leaf material removed during grazing. A value of +1 is given for light defoliation (<40% utilized), 0 for moderate defoliation (40-55% utilized), and -1 for heavy utilization of the plant (>55% utilized). Opportunity is determined by the amount of time plants have to grow prior to grazing or the time plants have to regrow after they have been grazed. A value of +2 is used when plants had the full season to grow or regrow, +1 for most of the season, 0 for some chance, -1 for little chance to regrow, and -2 for no chance to grow or regrow through the growing season. All of the frequency, intensity, and opportunity values are added together to give a positive, neutral, or negative rating for the grazing impacts over the year. The GRI was designed to give ranchers an assessment of how their grazing strategies worked over the year, as well as a basis for planning for the next year (Reed et al. 1999).

Ranchers can also use photo monitoring as a basis for planning and to assess changes in their rangeland over time. A permanent location is marked with something like rebar, and photos are taken each year at the same time of the year. The Range Management School recommends taking photos at midday with the horizon in the upper third of the picture and with a recognizable feature in the background. Photos should be

taken just before or immediately after grazing and then again at the end of the grazing season to see how the area recovered (LeValley et al. 2003).

IMPLICATIONS FOR CURRENT RESEARCH

The literature reviewed here provides insights on numerous studies and research in adoption-diffusion as well as outreach and extension. Additionally, research on factors to adoption, such as economics and environment, prove invaluable when evaluating the success of information and technology transfer. Researchers have applied this knowledge to studies on range management innovations, particularly in evaluations of characteristics of innovators and their motivations for innovation. There is much to learn, however, in how ranchers work through the adoption process and the characteristics of outreach and extension that aid or diminish adoption of range management innovations.

CHAPTER 3

SURVEY OF RANGE MANAGEMENT CHANGE AMONG WEST-CENTRAL COLORADO RANCHERS

Previous studies have examined range management adoption, rancher characteristics associated with adoption, and barriers and facilitators of the adoption process (Grigsby 1980, Lacey et al. 1985, Rowan and White 1994, Coppock and Birkenfeld 1999, Kreuter et al. 2001, Peterson and Coppock 2001, Rowe et al. 2001a, Rowe et al. 2001b, Didier and Brunson 2004, Kreuter et al. 2004, Fernandez-Gimenez et al. 2005). While some of these have looked at uptake of innovation or willingness to participate in new programs, there are no studies that we know of that specifically address the effects of a rancher School on technology transfer.

In an effort to aid in the School's progress, as well as to enlighten other range management outreach efforts, area ranchers, including School attendees, were surveyed on their adoption of range management practices and their use/non-use of the Range Management School for Ranchers. The objectives of the study were to identify characteristics of ranchers and ranch enterprises that are associated with decisions to change range management practices, identify characteristics of ranchers and ranch enterprises that are associated with decisions to attend the School, and identify factors that assist ranchers in making successful adoptions of range management practices.

METHODS

Data were collected in two stages: 1) a mailed survey; and 2) a series of qualitative interviews with area ranchers. This chapter presents data from the mailed survey; the following chapter describes the interview findings.

The survey was mailed to all 647 persons on the mailing list for the CSU Tri-River Extension Office. This list included Forest Service and BLM permittees in Mesa, Delta, Montrose, San Miguel, Ouray, Hinsdale, Saguache, and Gunnison counties, as well as other individuals in the area who were on the mailing list because of past participation in range and livestock extension programs.

The survey was four pages and included both close-ended and open-ended questions on rancher and operation demographics, ranchers' evaluations of the School, changes made to their range management, and how they learn new information about range management.

Surveys were conducted using elements of the Tailored Design method (Dillman 2000). A brief pre-notice letter was mailed in late July 2003 informing recipients that they would be receiving a survey. The questionnaire was mailed in early August, along with a cover letter and stamped return envelope. The cover letter explained the purpose of the study, provided contact information for the researchers, and assured recipients that their participation was voluntary and that their answers would remain confidential.

A postcard was sent in mid-August to serve as a thank-you to those respondents who mailed their surveys and as a reminder to others who had not yet mailed them. Two

weeks after the postcard was sent, a fourth mailing of another letter and replacement survey was sent to ranchers who had not yet responded.

As part of the Tailored Design method, Dillman (2000) recommends following the fourth mailing with a final effort to elicit response, made either by telephone or special mail. This contact was not made for this survey. Telephone numbers were not available, and special mail was deemed impractical for copious non-respondents previously unresponsive to mailed correspondence.

All in all, 247 filled-out surveys were mailed back for a return rate of 38%. Sixty-one of the respondents did not raise livestock in 2002 or 2003, producing a final sample size of 186 respondents. Survey responses were coded and some descriptive statistics were obtained for answers to close-ended question, while qualitative answers to open-ended questions were compiled and analyzed for common themes.

Comparative statistics were not used in the analysis of survey results. Tests of statistical significance, like the chi-squared test, determine whether relationships found among variables in a sample are likely to be present in a population (Knoke et al. 2002). This survey was a census of the population rather than a sample.

The population for this study was specifically ranchers exposed to the Range Management School for Ranchers. Because the population was relatively small and high response could not be guaranteed, we aimed to survey every member of this population as to have ample respondents for the second stage of the study. This second stage, qualitative interviews (described in Chapter 4), was dependent on several survey respondents voluntarily identifying themselves on the survey and agreeing to be interviewed.

Non-Response Bias

Because the Extension mailing list did not include rancher telephone numbers, non-respondents were not contacted to determine whether survey respondents were significantly different from ranchers who did not respond. However, residence could be compared based on information from the mailing list. Fifty-three percent of respondents had mailing addresses within Gunnison Basin, while 49% of non-respondents had mailing addresses within Gunnison Basin. It should be noted that the survey materials mentioned our study area as Gunnison Basin, when 50% of the ranchers surveyed had mailing addresses outside the basin. Also, Schools have been primarily held in towns within Gunnison Basin, particularly in Delta, where CSU's Tri-River Extension Office is located.

To help further understand the representativeness of the sample, respondent characteristics were compared with characteristics listed in the 2002 USDA Census of Agriculture for the four counties with the highest number of respondents. A few differences were found (Table 1); however, it should be noted that the Census was of all agricultural producers in the area, while our survey examined only ranchers that had been aware of the Range Management School for Ranchers via the CSU Extension mailing list. With the exception of Mesa County, respondents were more likely to make a majority of their income in agriculture than other farm/ranch owners in the area. While this may be an indicator of a bias toward active ranchers, this is not problematic as the outreach programs the survey was designed to inform will be targeted primarily to active ranchers. Respondents in Gunnison and Mesa counties tended to be older than other farmers and ranchers in the area.

Table 1. Characteristics of 2002 USDA Census versus mailed survey respondents.

	2002 Census	2003 Mailed Survey
<u>Delta County</u>	n=1,063	n=43
Farming as primary occupation (%)	58.7%	65.9%
Average age	56.1	56.7
<u>Mesa County</u>	n=1,599	n=46
Farming as primary occupation (%)	51.2%	50.0%
Average age	55.2	58.6
<u>Montrose County</u>	n=915	n=36
Farming as primary occupation (%)	58.1%	64.7%
Average age	55.1	55.16
<u>Gunnison County</u>	n=186	n=16
Farming as primary occupation (%)	62.9%	71.4%
Average age	53.1	62.8

RESULTS AND DISCUSSION

Respondent Characteristics

Fifty-nine percent of respondents attended the Range Management School for Ranchers; 41% of respondents said they had not attended the School.

A majority of respondents were college-educated, with 70% reporting some college to post-graduate education. Ranchers surveyed tended to have long tenures on their operations, with 48% percent managing operations that were in their families for 25 years to 75 years, and 24% indicating that their operations had been managed by their families for more than 75 years.

Ranchers were nearly evenly split in regards to how long they expect to continue ranching. Fifty-two percent expected to continue ranching no more than 10 more years, while 48% expected to ranch indefinitely. Ranchers varied in their expectations for the future of their operations after they ceased ranching themselves. Many ranchers did not know what the future of their operation would be (31%), thought another family member

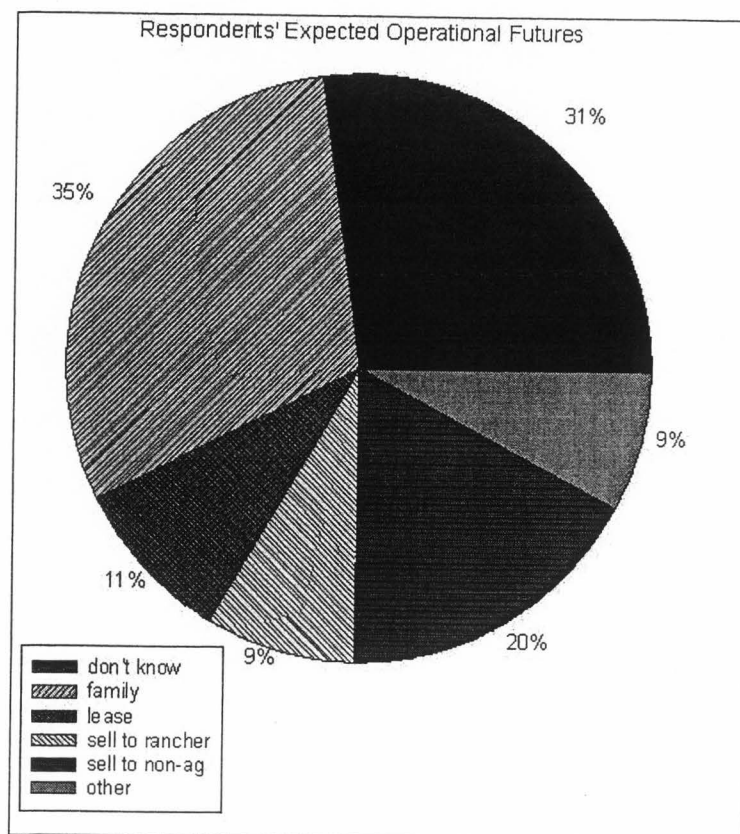


Figure 1. Expected operational future of all respondents.

would take over (35%), or expected the operation to be sold for nonagricultural uses (20%) (Fig.1).

Ranchers' operations varied in size and production. Thirty-five percent ran 100 animals or fewer, 49% ran 101-500 animals, and 17% ran more than 500 animals. Ranchers produced a wide gamut of income sources on their operations, from buffalo to game birds; however, chief operation types were cattle and hay (37%), cattle only (22%), and cattle, hay and fee-hunting (17%) (Fig. 2).

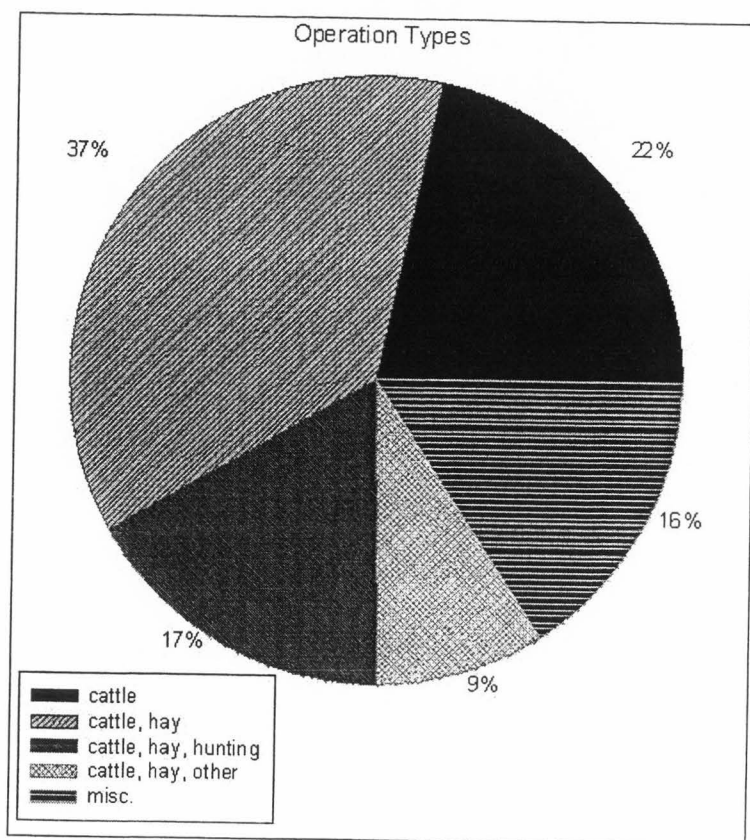


Figure 2. Operation types of all respondents.

Public lands were commonly used as a forage base among respondents. Much of the study area is made up of lands managed by the Forest Service and BLM. Fifty percent of respondents had grazing permits with both the Forest Service and BLM, 26% had only BLM permits, 15% had only Forest Service permits, and 10% had neither a Forest Service or BLM grazing permit.

Respondents were most commonly from Mesa, Delta, or Montrose counties. Seventy-three percent of respondents listed one of those counties as their operation base.

Changes in Range Management

The survey asked respondents simply if they had tried using range management practices that differed from what they traditionally used. Seventy-three percent of

respondents reported making changes in their range management since 1995. Changes included minor alterations like dividing a pasture into two, as well as extensive changes like new grazing rotations.

Eighty-seven percent of those ranchers making changes altered their fencing and/or watering systems. Common changes to watering systems included adding more water sources to improve animal distribution, as well as improving ponds and developing springs to increase use of current water sources and to enhance water quality. Cross-fencing and employing electric fences were common changes in fencing systems.

Eighty percent of ranchers making changes in their range management said they had changed their pasture rotation, including grazing frequency and timing (Fig. 3). Forty-three percent reported changes in how they monitored their forage bases; common techniques were photo points and the Grazing Response Index. Forty-one percent reported changes in animal handling, such as low-stress livestock handling.

Other changes made were brush, weed, and poisonous plant control. Methods included mechanical treatments like roller chopping, controlled burning, chemicals, as well as targeted grazing by sheep and cattle. Ranchers described keeping "sheep ahead of cattle to control poison" or using animals for "late season brush control grazing on the National Forest." Eleven percent of ranchers making changes in their range management described controlling brush in some way.

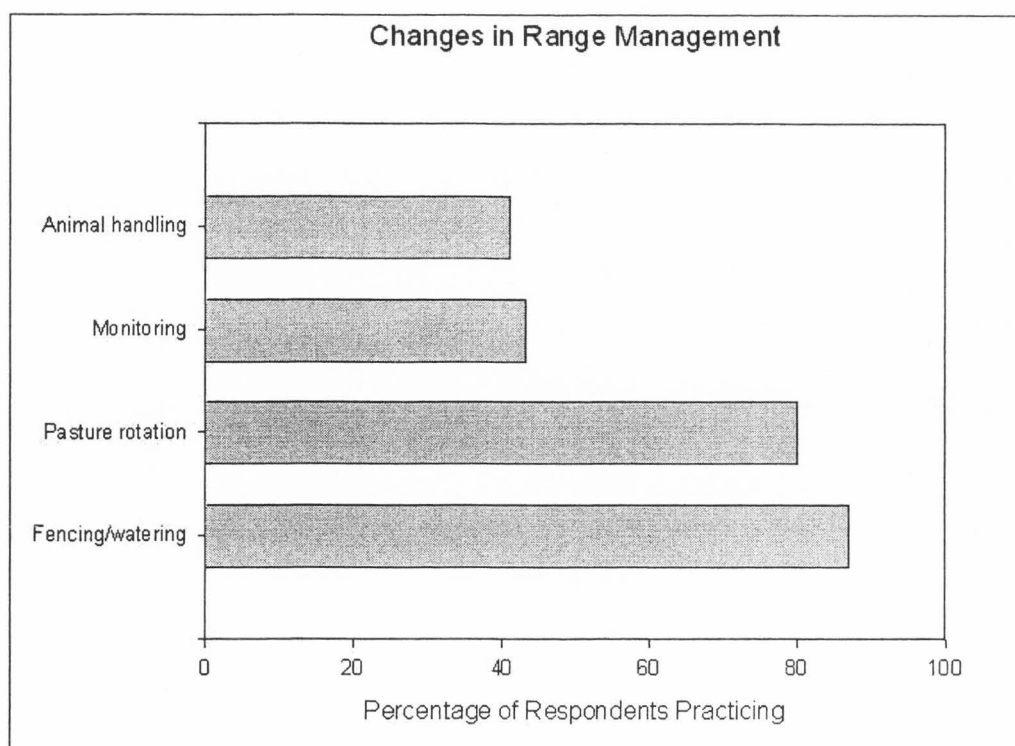


Figure 3. Common range management changes among respondents.

Characteristics of Changers Versus Nonchangers

This study identified several rancher and operational characteristics associated with decisions to change range management practices. Characteristics associated with decisions to change range management included commitments to the future of the operation, larger operation sizes, dependence on ranch income, use of federal grazing allotments, as well as greater frequency of use of agency information sources and more frequent contact with extension.

Operation Future. Didier and Brunson (2004) found that ranchers who adopted innovations were strongly committed to the ranch being in place for future generations. They explained that ranchers with commitments to ranching in the future may be more willing to continue investing in improvements than producers who believe that their

ranches will be sold in the near future. Similarly, this study found that ranchers making changes were more likely to have an idea of the operation's future, such as another family member taking over the operation. Ranchers not making changes often responded that they did not know what would happen to their operation after they ceased ranching it themselves (Fig. 4).

Ranch Income. Ranchers making changes were more likely than nonchangers to have a majority of their income from ranching. Seventy percent of changers made more than half of their income from agriculture, while only 44% of nonchangers made more

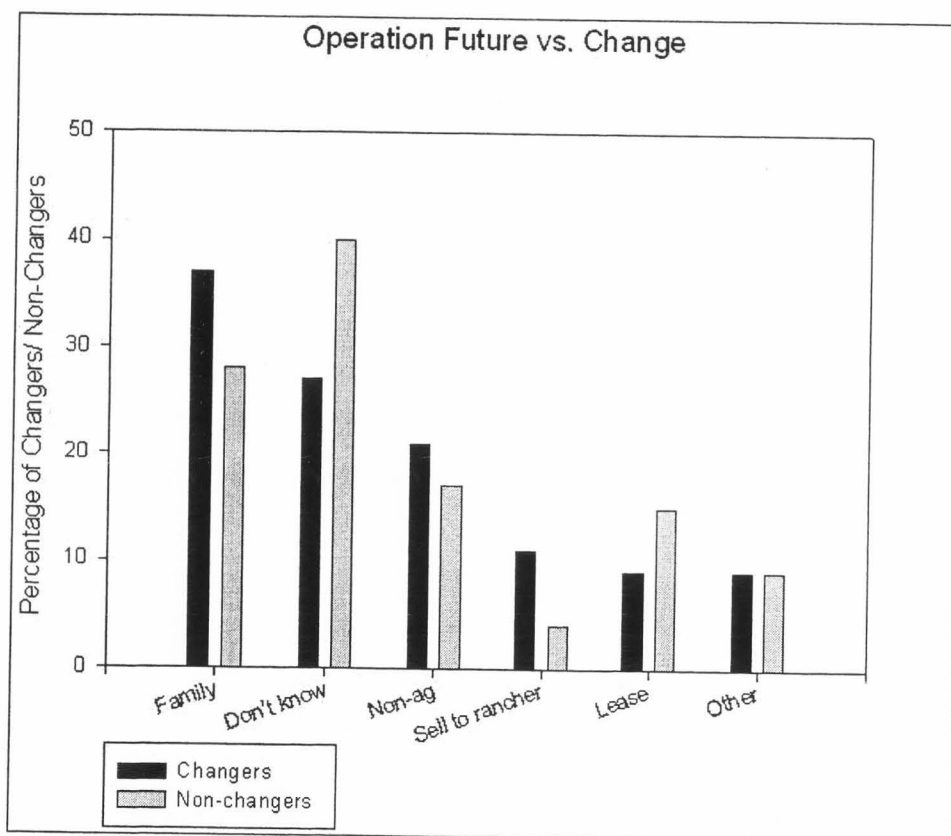


Figure 4. Operation futures for changers versus nonchangers.

than half of their income from agriculture (Fig. 5). Didier and Brunson (2004) found that innovative ranchers in Utah were similarly dependent on ranch income, as did Rowan and White (1994) in a survey of Texas ranchers. Rowan and White found that ranchers who invested in weed and brush control had higher proportions of family income from livestock production and less off-ranch income. In another survey of Texas landowners (Kreuter et al. 2004), 90% of respondents who selected source-of-income as the main reason for owning their property were willing to enroll in a brush reduction program, while 69% of respondents who selected place-to-live as their primary reason for ownership were willing to enroll in the program.

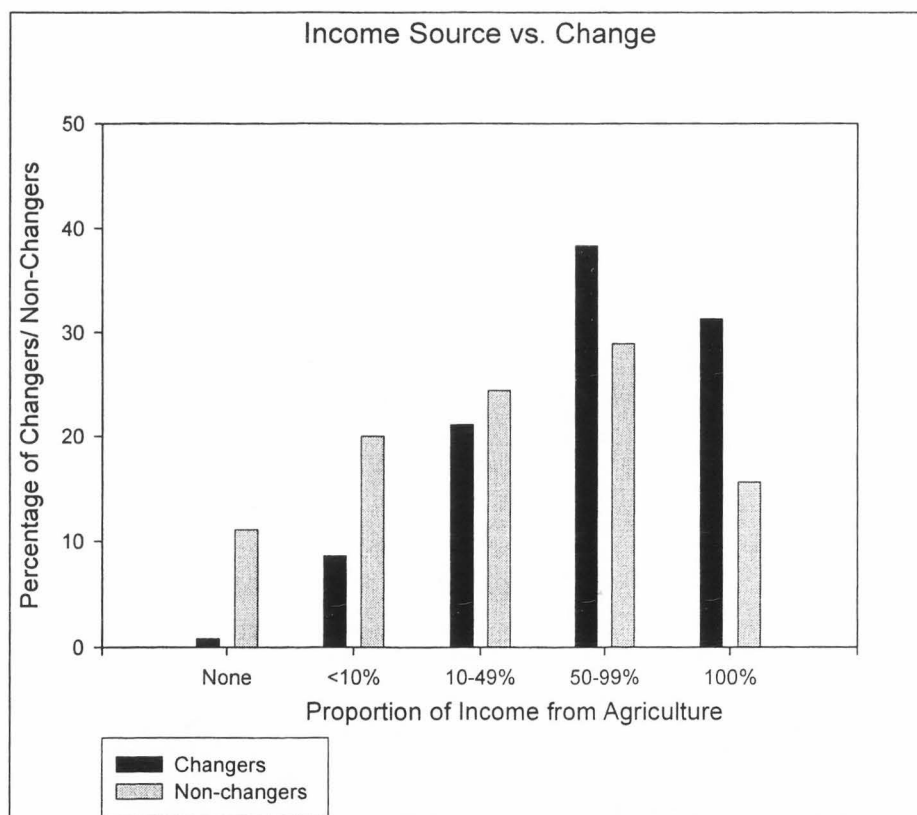


Figure 5. Proportion of income from agriculture among changers versus nonchangers.

Operation Size. Ranchers with smaller operations (fewer than 100 animals) were less likely to make changes in their management than medium (100 to 500 animals) or large operations (more than 500 animals). Seventy-four percent of changers were managing operations of more than 100 animals; 57% of nonchangers managed operations of fewer than one hundred animals (Fig. 6). Similarly, Coppock and Birkenfeld (1999) found in their survey of Utah ranchers that those with large operations used more range management practices than ranchers with smaller operations, and Lacey et al. (1985) found among Montana ranchers that those with large operations tended to invest more frequently than smaller operations in range improvements.

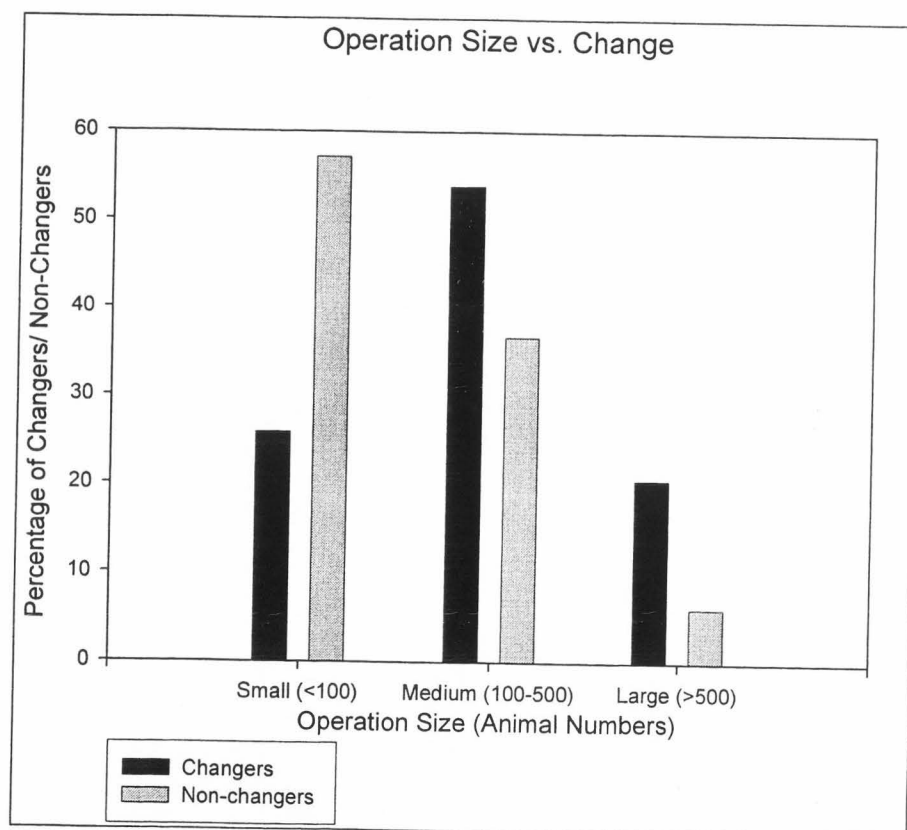


Figure 6. Operation size among changers versus nonchangers.

Operation size seems to play a role in multiple factors of range management change, including possession of grazing allotments and information sources. Medium and larger operations were more likely than smaller operations to make changes in their operations, as well as more likely to have federal grazing allotments and to see Forest Service and BLM personnel as important information sources in range management decisions (Table 2).

Kreuter et al. (2004) similarly found in their survey of Texas landowners that respondents commonly selected Extension, other ranchers, and printed media as information sources on range management, but they found that a significantly greater proportion of midsize- and larger-property owners use these sources than small-property owners. This was not reflected in our results; however, it should be noted that this study measured operation size via number of animals while Kreuter et al. classified landowners by number of hectares owned.

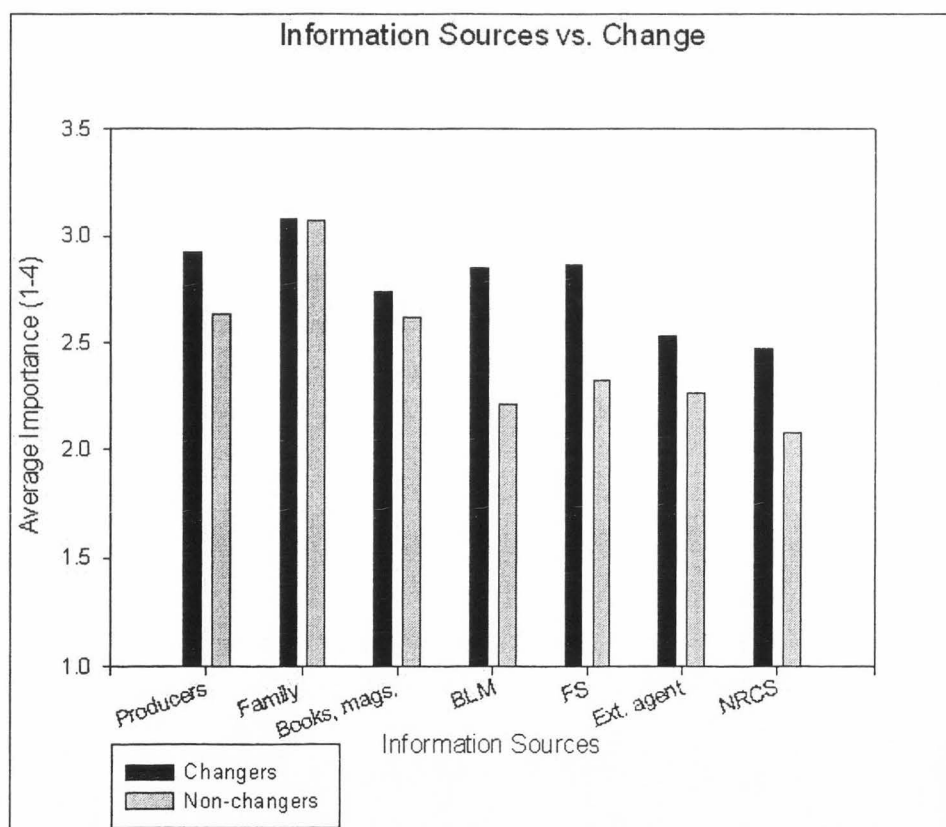
Information Sources. Important information sources to ranchers making changes were family members, other producers, books and magazines, as well as Forest Service and BLM personnel. Ranchers not making changes also saw family, other producers, and books and magazines as important information sources, but saw Forest Service and BLM personnel as less important sources in their range management decisions (Fig. 7).

Grazing Allotments. Possession of grazing allotments had a positive effect on ranchers adopting new range management practices. Eighty-four percent of ranchers with both a Forest Service and BLM grazing allotment were adopting new range management practices, while 35% of ranchers with neither a Forest Service nor BLM

Table 2. Operations' size effect on change, permit holdings and information sources.

	Small (<100 animals)	Medium (100-500 animals)	Large (>500 animals)
Made changes in range management	55%	80%	90%
Forest Service allotment	38%	75%	90%
BLM allotment	58%	81%	93%
Information Sources:*			
Family	3.1	3.1	3.1
Other Producers	2.9	2.9	2.9
Forest Service personnel	2.2	3.0	3.1
BLM personnel	2.3	2.8	3.2
Extension agent	2.5	2.5	2.5
NRCS personnel	2.3	2.4	2.5
Books, magazines	2.7	2.8	2.6

*sources were scored 1-4 in importance; 1=not at all important, 4=very important.

**Figure 7.** Information sources for changers versus nonchangers.

allotment had made changes in their range management (Fig. 8). Peterson and Coppock (2001) similarly found that Utah permittees were more active in their management than private-land operators, and that their motivations for active management were dominated by economic factors rather than fears over restricted grazing.

Motivations for Change. Fifty percent of nonchangers indicated they were content with their operation as it is currently managed; in other words, they did not see a need to change. Twenty-seven percent of nonchangers said they had not made changes because they planned to retire soon, 27% said they could not afford the financial cost of

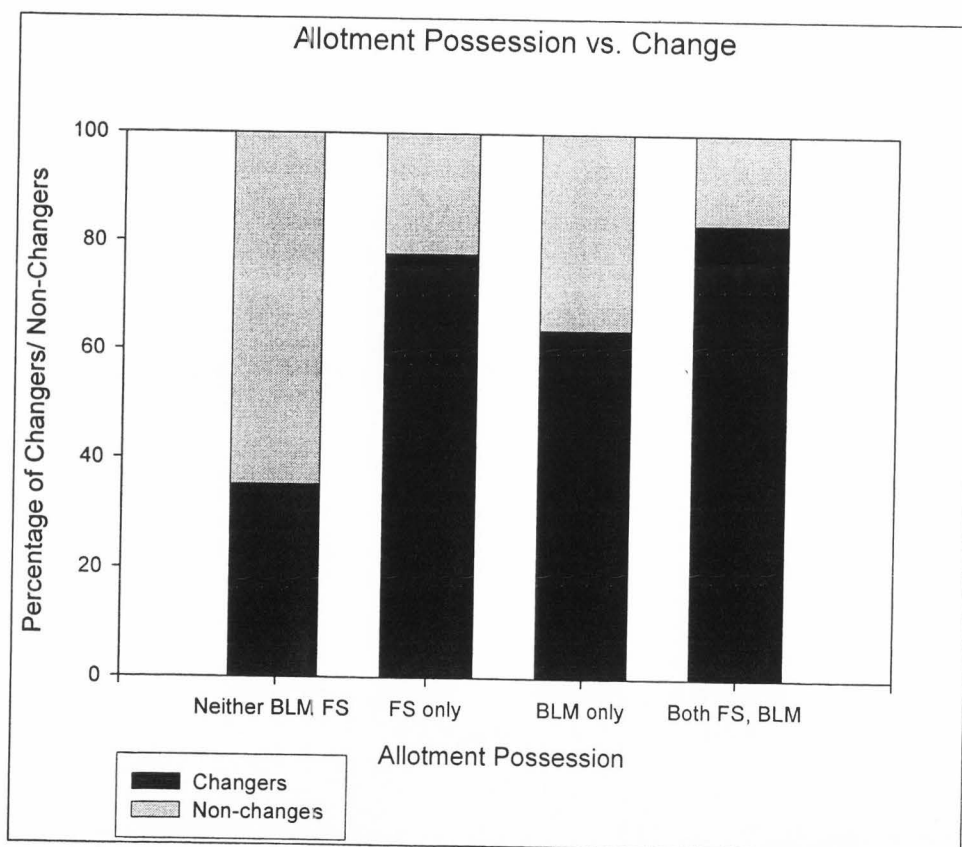


Figure 8. Allotment possession among changers versus nonchangers.

change, 25% said they did not know what changes would help their operation, and 17% said they could not invest the time needed for change. Respondents also mentioned specific constraints like rising land prices, unpredictable futures on public lands, and significant elk damage to fences and forage bases as major obstacles to management change. Peterson and Coppock (2001) found similar reasons cited among Utah ranchers for not investing in their operations; primary reasons given were retirement, economic constraints, changes were not needed, and land constraints.

Changers ranked rangeland health, forage production, profitability, and water quality and availability as top motivations behind their range management, while having to change for financial reasons or BLM or Forest Service requirements was least important (Fig. 9). Similar motivations were identified by Didier and Brunson (2004); ranchers interviewed said they adopt practices to improve profitability and conserve natural resources, and often emphasized the link between those goals.

Contact with Extension. Ranchers making changes in their range management had more frequent interactions with CSU Extension programs and staff, such as attending an Extension program or visiting the Extension office. Changers called or spoke to Extension personnel an average of 1.6 times per year, while nonchangers spoke to Extension personnel an average of 0.8 times per year (Fig. 10).

Changers were more likely to have attended the Range Management School for Ranchers; 51% of changers reported having attended the School while 13% of nonchangers had attended. This seems to indicate that the School plays a role in range management change among ranchers in West-Central Colorado. The next chapter further explores that role, as well as factors associated with attendance.

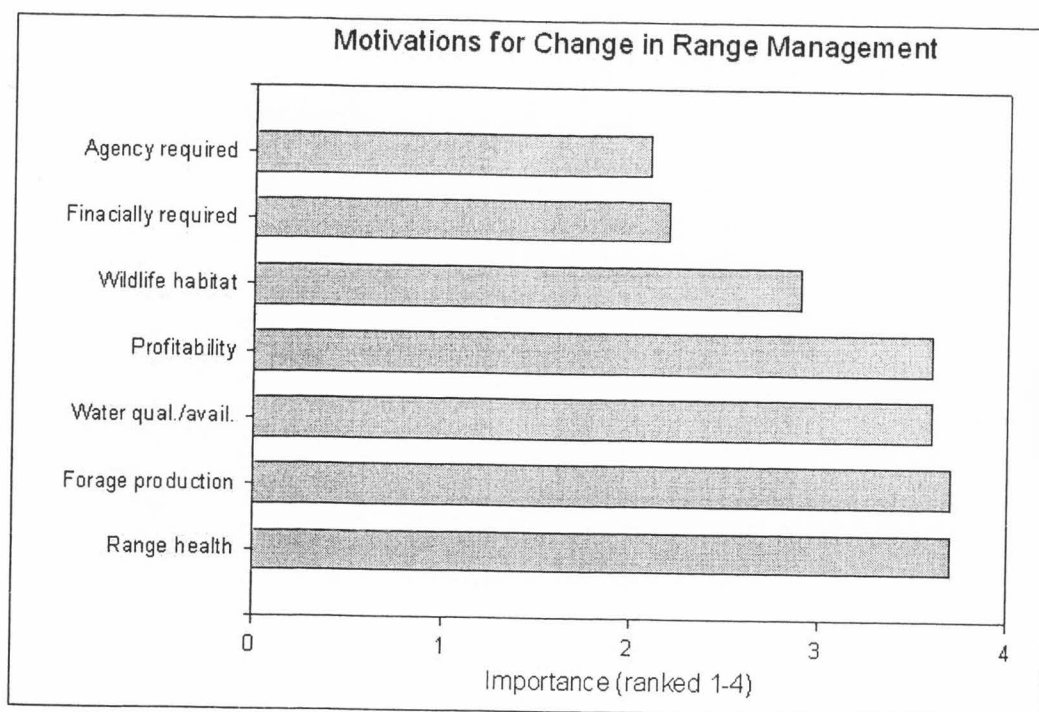


Figure 9. Motivations for change in range management. Sources were scored 1-4 in importance; 1=not at all important, 4=very important.

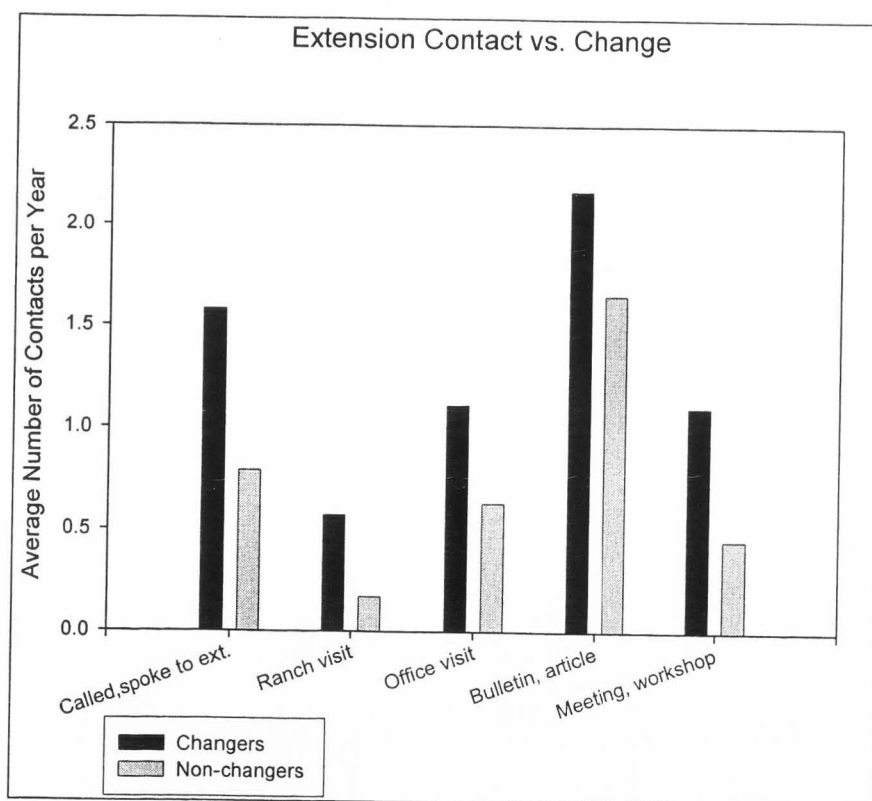


Figure 10. Contact with Extension for changers versus nonchangers.

Characteristics of School Attendees versus Nonattendees

Most School attendees were from Delta, Montrose, and Mesa counties (Fig. 11). Schools have been primarily held in Delta and less frequently in surrounding towns like Montrose, making them most accessible by ranchers in Delta, Montrose, and Mesa counties. However, many ranchers from surrounding counties travel long distances to workshops.

Similar to attendees, nonattendees were most commonly from Mesa (28%), Delta (15%), Montrose (23%), and Gunnison (22%) counties; however, attendees outnumber nonattendees among respondents in Delta County. This is likely due to Delta County

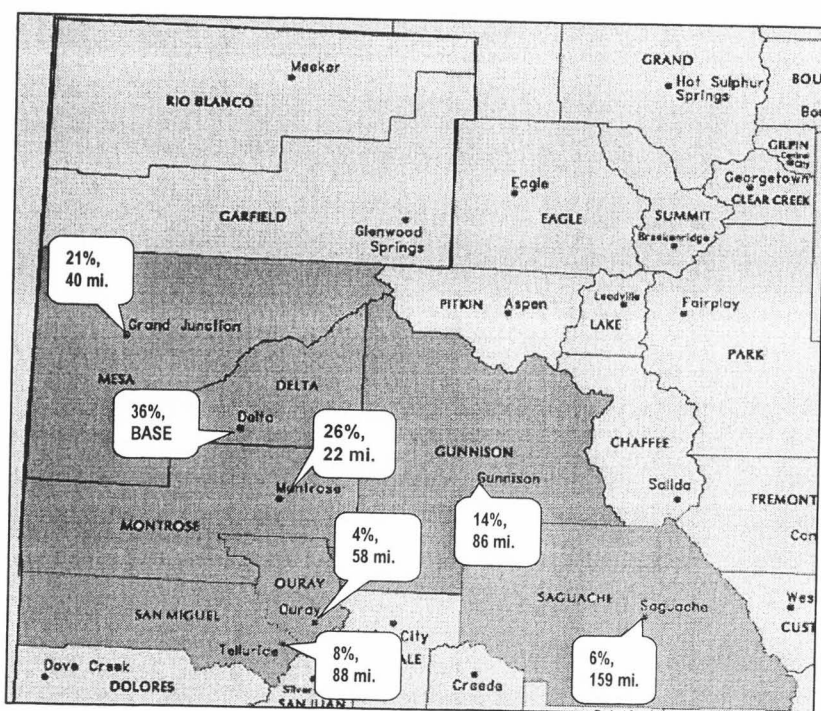


Figure 11. Home counties among attendees of the Range Management School for Ranchers, and distances of county seats from Delta, the School's base and location of the CSU Tri-River Extension Office.

being the School's headquarters, location of the CSU Tri-River Extension office, and home to many of the agency personnel and ranchers associated with creating the School.

Ninety-seven percent of School attendees had grazing permits, which is expected given that the Extension mailing list largely included permit holders from Forest Service and BLM permittee lists. Similar to changers, attendees also tended to have larger operations than nonattendees. Seventy-eight percent of attendees had more than a hundred animals compared to 58% of nonattendees with more than a hundred animals (Fig. 12).

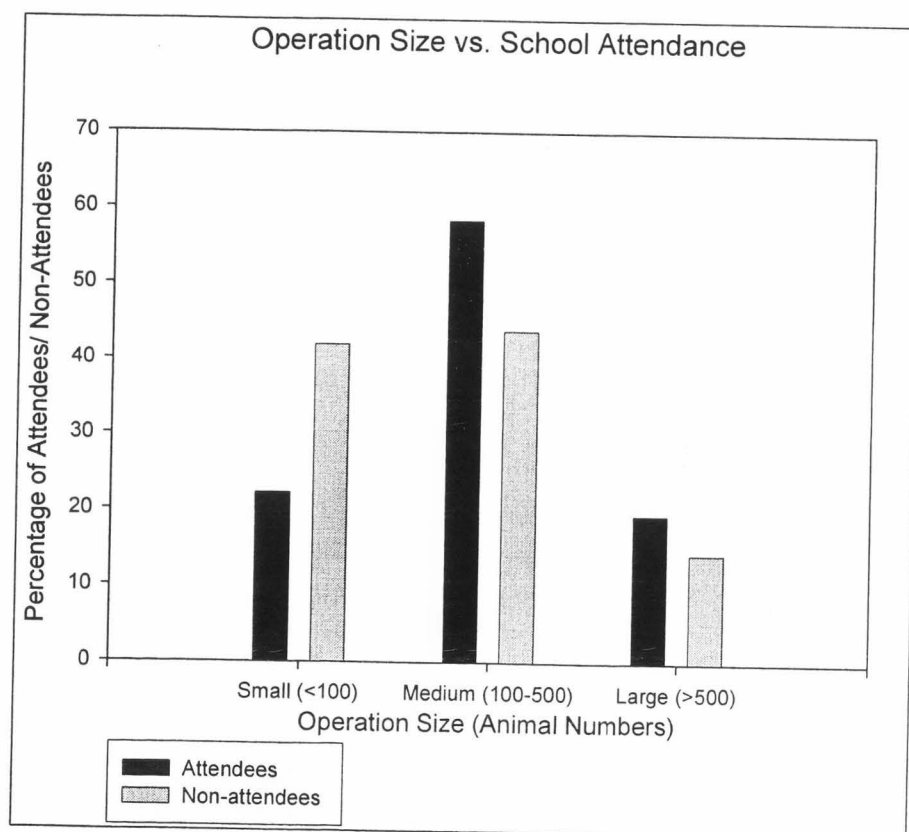


Figure 12. Operation size for attendees versus nonattendees.

More attendees than nonattendees also had a majority of their household income from farming and ranching activities. Seventy-two percent of attendees made more than half of their income from farming and ranching, while 56% of nonattendees made more than half of their income from farming and ranching (Fig. 13).

School's Role in Change. Ninety-two percent of attendees implemented change in their range management practices since 1995, while 62% of nonattendees have changed their range management practices since 1995. Many ranchers in the area report making changes in their range management; however, School attendance seems to positively influence ranchers' potential for change (Table 3).

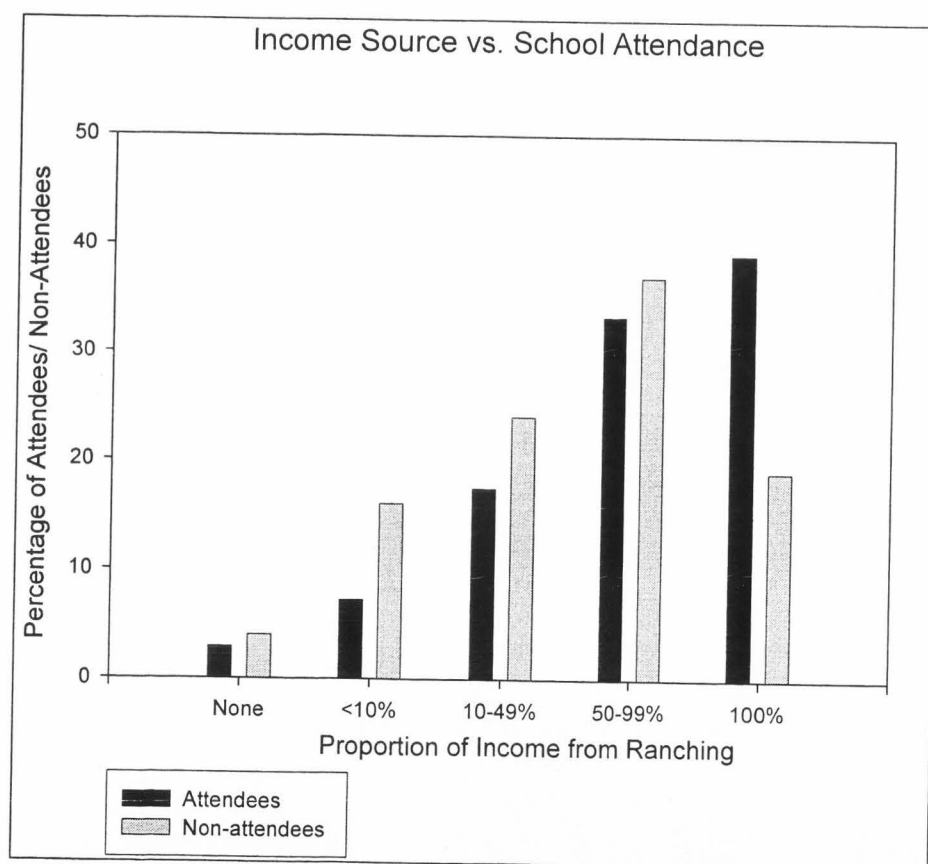


Figure 13. Income source for attendees versus nonattendees.

Table 3. School attendance versus range management change.

	No change	Change
Did not attend	38%	62%
Attended School	8%	92%

Forty-six percent of School attendees said that their range management practices did not change as a result of attending the School. Some made comments like, "But I understand why we needed to do what we were doing," or "We were doing most of what they talked about," indicating that for these ranchers the School likely acted as reinforcement of ideas that they were already trying.

Fifty-four percent of School attendees said their range management practices changed after attending the School. Several ranchers commented that after attending the School, they had the information they needed to make decisions on range management changes they were already considering. One rancher commented, "the class helped us decide." Another rancher said that changes made were "not necessarily because of the School, but the information given was a good source to help us with decisions."

Attendees often described improved monitoring and grazing strategies. Comments included: "I had a much clearer understanding of the range and monitor much more," and "We don't use the same pasture the same time every year. We're beginning a monitoring plan."

Fifty-nine percent of survey respondents had not attended the Range Management School. Of those who did not go, 34% said they hope to attend in the future, 22% said they did not have time, 18% did not think it would help, and 13% said they had not heard of the School despite their inclusion on the Extension mailing list.

Attendee Recommendations. Forty-one percent of survey respondents attended the Range Management School for Ranchers. These attendees were asked if they would recommend any changes to Range Management School for Ranchers, and if so, what they would recommend. Forty-one percent of attendees made recommendations, and commonly suggested improving class attendance, altering class content and materials, and adding more School locations.

Many attendees commented they felt more ranchers and agency personnel needed to participate in the Range Management School for Ranchers. Comments on rancher attendance included: "try to get more producers who really need to go to the workshops to attend," and "I feel that every person who runs on BLM or Forest Service land should be required to attend at least one meeting." Comments on agency attendance and participation included: "I strongly feel it should be offered all over the West and be mandatory for related government personnel," and "include wildlife agency to help control wildlife impact on private ground."

Some attendees commented they would like to see class content expanded to include other aspects of ranch management like forage quality and herd health, as well as more materials to identify range plants. One attendee said he/she would like to see more "emphasis on soil test, forage analysis, [and] protein count." Other comments included: "I would like to see more info. on the types of grasses, etc..." and "more animal health, vet experience, [and] better plant books; something to carry in the field, like pocket size."

Attendees commented they would appreciate hearing other ranchers' experiences as part of class presentations: "Have ranchers play a more active part in teaching what they experience," "I would like to see experienced ranchers' input on some programs

that have been tried on the ground, good or bad.” They also said they would like more opportunities for on-the-ground instruction, like “more hands on, i.e., in the field.”

Other comments from attendees were on class convenience, saying that classes were held at busy times for them or that they would like to see “classes in local areas instead of having to travel 100+ miles to attend.” Some also said that there was too much information in a short amount of time, and would appreciate additional class time.

SUMMARY AND IMPLICATIONS

This phase of the study sought to understand the characteristics of, and motivations behind, changes in ranchers’ range management practices, as well as their use of information sources and the Range Management School for Ranchers.

Consistent with prior research, this study found that frequent interaction with Extension, operational future, and proportion of income from ranching were all positively associated with decisions to make changes in range management practices among West-Central Colorado ranchers. Additionally, operation size correlated with adoption and attendance of the Range Management School for Ranchers. Larger operations primarily dependent on ranching income may be able to afford improvements and therefore seek out information about them because of economies of scale and fewer off-ranch commitments (Lacey et al. 1985, Didier and Brunson 2004).

Preferred information sources and possession of grazing permits also correlated with operation size. Interactions with Forest Service and BLM personnel should be considered as important factors in adoption, particularly among ranchers with larger operations.

Our findings also suggest smaller operations may be more difficult to engage by outreach efforts, as they seem to primarily rely on family members, other producers, and books and magazines as information sources. Further research may be necessary to identify alternative avenues for effective outreach on smaller operations.

Consistent with findings by Didier and Brunson (2004), primary motivations for change are values tied to a rancher's land base, like forage production, range health, and water quality. The BLM and Forest Service were important information sources to permittees, but requirements to conform to their regulations were not perceived as motivations for range conservation. More important motivations were perceived benefits of range management, like improved forage and profitability. This suggests outreach efforts incorporating frequent evidence of these positive outcomes encourage ranchers to progress in their new management direction.

The Range Management School for Ranchers incorporates frequent evidence of positive outcomes of range management into the curriculum, thus enticing ranchers to try an idea or to reinforce an idea that they are already trying by illustrating the benefits they can realize. The School plays dual roles as both facilitator and reinforcer of range management change but is less important as an instigator of change among ranchers who otherwise would be unlikely to make changes on their own.

Results suggest that, for many ranchers, the initiation of an idea for change comes from information sources important to them, such as other ranchers, family members, or the BLM or Forest Service. The School then acts as a road map showing how to get there, allowing ranchers to learn how to fit the practice into their own lives. The School seems to shift an idea from an abstract suggestion by a range conservationist to a

“practical and personal” piece of advice, and “once the idea became practical and personal, it became memorable” (p. 98, Gladwell 2002).

The School serves as a link between the knowledge and implementation stages of the innovation-decision process (Rogers 1995). Rogers explains that individuals move from initial knowledge of an idea to the stage of forming an attitude. At this stage, the individual actively seeks information about the innovation, begins to perceive the specific characteristics of the innovation, and favors or disfavors the innovation based on these characteristics. The attitude formed leads to a decision to adopt or reject the innovation. If the individual adopts the practice, he begins implementing the practice.

The School provides a venue to learn the specific characteristics of the innovation, giving ranchers necessary information to decide whether it will or will not work in their situation. Suggested improvements to the School, like more practical instruction from other ranchers and practice with on-the ground application, indicate a desire for increased opportunities to answer the question, “What will its advantages and disadvantages be in my own situation?”

According to Rogers (1995), this is a common question when forming an attitude about an innovation, as individuals are looking to decide whether to implement themselves. Other actions associated with these stages are looking to peers who have personal experience with the innovation and looking to first try it themselves on a limited basis (Rogers 1995). More opportunities for informed decisions can mean more implementation, as the comparison of attendees’ versus nonattendees’ rates of adoption suggests.

After making the decision to adopt, Rogers (1995) says individuals look for confirmation on their decision, and either find reinforcement or reverse the decision after learning conflicting ideas about the innovation. Survey comments suggest the School serves as a reinforcer among ranchers who have already initiated a range management change, providing needed confirmation and more information about practices they are trying.

All in all, our results demonstrate several rancher and operational characteristics associated with range management change, as well as important information sources for operational decision-making. Our research demonstrates the value of incorporating BLM and Forest Service personnel into outreach efforts among permittees, as well as the importance of providing venues such as the Range Management School. The School allows for frequent evidence of positive outcomes to facilitate and reinforce range management change among West-Central Colorado ranchers.

CHAPTER 4

QUALITATIVE EXAMINATION OF RANGE MANAGEMENT CHANGE AMONG WEST-CENTRAL COLORADO RANCHERS

Humans, like other animals, learn adaptations in order to live in constantly changing environments. Diverse forces like drought, political pressure, and rising production prices cause ranchers to reevaluate their management, and many work to adapt to these forces rather than walk away from their ranches and ranching lifestyles (Rowe et al. 2001a).

With adaptation comes a learning curve. As herbivores learn new behaviors in response to changing range management practices, their body condition and conception rates will often decrease for periods of one to three years (Provenza 2003).

One progressive rancher, Jim Howell (2002), wondered, "If we can understand the components of culture and more deeply appreciate the ways that animals interact with their environments, I think we might be able to smooth out those discouraging curves." Similarly, perhaps if we better understand how the adaptive ranchers interact with their environments, discouraging curves in production could be smoothed out and their ability to adopt alternative management strategies enhanced.

This research worked to explore how ranchers interact with their environments by investigating change processes experienced by ranchers in West-Central Colorado communities, including Delta, Paonia, and Montrose. Ranchers in this area are exposed to numerous range management ideas through neighbors, agency professionals, as well as

other learning opportunities like the Range Management School for Ranchers or Holistic Management programs.

Our research aimed to better understand how ranchers apply this new information about range management into practical application; in other words, how information on range management practices evolves from a magazine article or the Range Management School into practical application and integration into ranchers' operations.

Our research objectives were: 1) identify characteristics of ranchers and ranch enterprises that are associated with decisions to change range management practices, 2) identify characteristics of ranchers and ranch enterprises that are associated with decisions to attend the Range Management School for Ranchers, and 3) identify factors that assist ranchers in making successful adoptions of range management practices.

METHODS

Research was conducted in a 2-stage process. The first stage involved a 4-page survey mailed using the CSU extension mailing list for West-Central Colorado. The survey included inquiries into ranchers' range management, their use or nonuse of range management innovations, and sources of information for range management ideas (see Chapter 3).

Results from the mailed survey were used to develop themes for further questioning in the second stage, qualitative interviews. Data from the qualitative interviews will be the focus of this chapter.

Qualitative research is increasingly acknowledged as a valuable tool in understanding range management decision-making (Didier and Brunson 2004, Sayre

2004). "With its greater flexibility and attention to context, qualitative research can reveal social, historical, political, and economic factors that affect ranch management but have eluded quantitative studies" (p. 668, Sayre 2004).

While quantitative research requires standardized answers, qualitative research can be flexible and open-ended, allowing emergence of unanticipated factors (Sayre 2004). Qualitative methods also allow the researcher to evaluate decision-making and decision-making environments on a case-by-case basis. The researcher spends time with individual ranchers and their ranches, gaining knowledge on rancher behavior and their management that cannot be captured using aggregate, quantitative methods.

For this study, interviews were open-ended and conversational, but semi-structured using an interview guide (Appendix B). Questions focused on topics exploring how ranchers made changes to their operations, what forces drove them to make changes, and how they have learned from their peers and other information sources.

The interview sample included a subset of the previous survey respondents. The survey asked respondents if they would be willing to be contacted by a graduate student "who would ask more about your experiences as a livestock producer."

Eighty-eight respondents indicated yes and provided their names and contact information. These 88 respondents differed in some ways from respondents who did not agree to be interviewed. Respondents who agreed to be interviewed were more likely to have made changes to their range management, more likely to have attended the Range Management School for Ranchers, and more likely to graze animals on BLM or Forest Service allotments. They also had larger operations and made more of their income from farming and ranching (Table 4).

Table 4. Comparison of respondents who agreed and did not agree to interview.

	Did not agree to interview	Agreed to interview
Made changes to range management practices since 1995	62%	84%
Attended Range Management School for Ranchers	29%	54%
Grazed Forest Service allotment	57%	72%
Grazed BLM allotment	66%	85%
<u>Operation Size</u>		
Small(<100 animals)	43%	25%
Medium(100-500 animals)	45%	53%
Large(>500 animals)	12%	22%
<u>Proportion of income from ranching</u>		
<10%	19%	12%
10-49%	29%	14%
50-99%	32%	40%
100%	20%	34%

Eighteen respondents were selected from the 88 who agreed to be interviewed, using a stratified sample based on their decisions to attend/not attend the Range Management School for Ranchers, decision to implement/not implement range management change in their operations since 1995, and types of range management change implemented. We selected interviewees using these criteria in hopes of learning from a variety of perspectives on the School, range management change, and range management practices. Completely random sampling might have yielded only respondents who had made common changes like adding new water sources or changing fencing systems. Stratified sampling allowed us to interview respondents who tried both

common and less common practices, such as range monitoring and alternative animal handling. Sixteen of the 18 respondents selected were interviewed, after multiple attempts to contact 2 respondents were unsuccessful.

Each of these 16 ranchers was also asked to identify other ranchers they knew who made changes to their operations. This snowball sampling (Hendricks and Blanken 1992) provided opportunities to interview ranchers who did not respond to the survey or were not on the extension mailing list and who have been difficult to access otherwise. Seven ranchers were identified using this method and interviewed, creating a total interview sample of 23 ranchers.

The stratification of interviewees, including those from the survey sample and snowball sample, is outlined in Table 5.

Table 5. Stratification of interviewees, survey sample, and snowball sample.

	Attended Range Management School for Ranchers	Did not attend Range Management School for Ranchers
Nonchangers	3	3
<u>Adopters of fencing/watering systems, pasture rotation, NOT monitoring or animal handling</u>		
Survey Sample	2	2
Snowball Sample	1	1
<u>Adopters of monitoring/animal handling</u>		
Survey Sample	3	3
Snowball Sample	4	1

Analysis

Interviews were conducted and analyzed using elements of grounded theory methodology (Strauss and Corbin 1990). With this approach, conclusions were derived inductively, allowing us to develop observations into patterns and theories.

Initially, we classified interviewees as either implementing or not implementing range management change in their operations since 1995 based on their answers in the mailed survey. These two groups were identified as "changers" or "nonchangers." Survey results indicated that these two groups had particular characteristics (Table 6).

As interviews progressed, classifying ranchers simply as changers and nonchangers proved to be inadequate. Ranchers explained that they were always changing, most often in response to varying needs of their own family and finances, as well as changing political forces and ecological conditions. Ranchers' aptitude for change in their management was affected by a complex interplay of multiple external motivations and barriers to adoption, as well as their own personal and operational

Table 6. Characteristics of changers and nonchangers from mailed survey.

	<u>Changers</u>	<u>NonChangers</u>
<u>Characteristics</u>	Multi-generation operation	Smaller operations
	Larger operations	Unsure of future of ranch
	Majority of income from farming/ ranching	
	Committed to future of ranch	
	Possessed BLM/Forest Service allotments	
	Perceived BLM and Forest Service as important	

characteristics, including personal outlooks on the idea of change itself. This is reflected in literature on decision-making in agriculture (see Chapter 2).

New poles emerged during interviews. Rather than fitting within categories of changers or nonchangers, interviewees fit along a continuum of those making highly substantive changes to those making only minimal and corrective changes, with many ranchers incorporating both corrective and substantive changes into their management.

Substantive change is a change that revolutionizes the way ranchers are operating, changing how they think about their management, changing their management goals, and changing the course of their operational futures altogether. These changes require significant investments of time, money, and/or labor.

An operational shift to managing under Holistic Management principles is a substantive change experienced by several interviewees. Managing with these principles causes ranchers to reevaluate their management practices, and set clearly defined operational goals that encompass their quality of life, production, and land resources.

Corrective change is an adjustment to management already in place. Corrective changes often also require significant investments of time, money, and/or labor, but overall management strategies and goals do not change. Corrective change can play dual roles in range management regimes as, 1) maintenance and/or 2) building blocks for future substantive changes.

As *maintenance*, ranchers use corrective change to maintain current management. If current management strategies are sustainable, then there may be no need to move along the continuum to further substantive changes. For example, a new water

development might be a corrective change that maintains the current management intensive grazing system.

As *building blocks*, ranchers build upon corrective changes to alter their course of management altogether, creating larger-scale substantive changes. For example, ranchers may incorporate electric fence into their current grazing rotation. But, as they learn how to use it, they see that it can be a tool to change their grazing regimes altogether. Thus a smaller corrective change becomes the building block for a large scale, substantive change.

The duality of corrective change as both maintenance of current management and building blocks to more substantive change contributes to the idea of change working as a continuum, rather than stagnant adoption or nonadoption. The continuum of corrective to substantive change is a central component of the change process.

Change Process. Theories on the change process were built on the “paradigm model” described by Strauss and Corbin (p. 99, 1990). The model aims to describe a phenomenon – in this case, ranchers’ range management regimes – as well as the causal conditions, context, intervening conditions, action/interaction strategies and consequences relating to the phenomenon (Fig. 14).

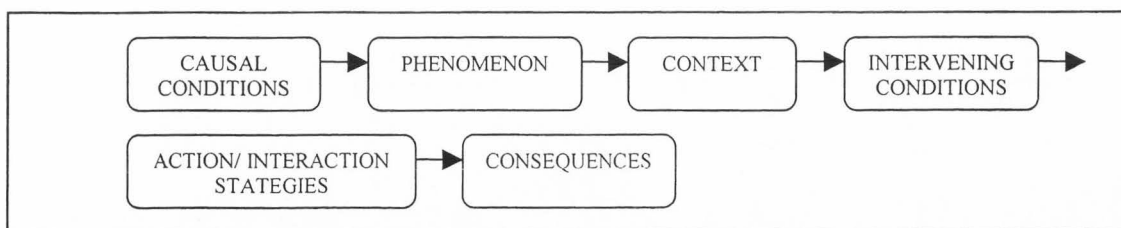


Figure 14. Paradigm model (Strauss and Corbin 1990).

Phenomenon. The phenomenon is the central event that actions/interactions are managed around. For the data discussed here, a rancher's range management regime is the central phenomenon. The range management regime is defined as the set of practices employed by ranchers to manage their public and private range.

Causal conditions. Causal conditions are the "events or incidents that lead to the occurrence or development of a phenomenon" (p. 100, Strauss and Corbin 1990). These events are often triggers, spurring the manager to action. Examples of causal conditions influencing a range management regime are impending regulatory action or attending a workshop and hearing an enticing idea.

Context. Context refers to the "specific set of properties that pertain to a phenomenon" and the dimensional range of those properties, i.e., intensity, duration, scope, etc. (p. 101, Strauss and Corbin 1990). For a range management regime, the context refers to labor intensity or cost of management, the time and land scale involved, etc.

Intervening Conditions. Intervening conditions are "the broad and general conditions bearing upon action/interactional strategies" that act to "facilitate or constrain the action/interactional strategies" (p. 103, Strauss and Corbin 1990). Some intervening conditions impacting range management regimes are ranchers' relationships with land management agencies, as well as the amount of time, labor, and capital available for range management.

Action/Interactional Strategies. Action/interactional strategies are the actions taken to manage the phenomenon and are essentially sequential and goal-oriented – done in steps and "in response to or to manage a phenomenon" (p. 104, Strauss and Corbin

1990). For a range management regime, these strategies are those steps that a rancher takes to incorporate a range management tool into his/her operation.

Consequences. Consequences are the outcomes of the actions and interactions taken to manage for the phenomenon, as well as the outcomes of failure to take action. Consequences may also become the context or intervening conditions for another set of actions in the future. For example, as mentioned above, recognized benefits of a smaller scale, corrective change on a rancher's range may lead to a broad-scale version of that change, resulting in substantive operational and strategic changes.

RESULTS AND DISCUSSION

Following are descriptions of the change process for substantive and corrective changes, based on the "paradigm model" outlined above (Strauss and Corbin 1990). The change process described centers around the phenomenon of range management regimes and aims to describe the causal conditions, context, intervening conditions, action/interaction strategies, and consequences relating to changes in range management regimes.

Causal Conditions

Causal conditions varied for corrective and substantive changes. Corrective changes were usually triggered by an immediate need, such as drought-induced water shortages or a weed or pest outbreak. New influxes of resources, like drought relief, also resulted in corrective change. One common causal condition for corrective change was a

marked decrease in water quality and/or quantity, resulting in pond or spring improvements.

... We've done some work on (the springs), quite a bit of work on them this spring... improving the sites where the tanks themselves sit and also ... We built a kind of fence around the tanks themselves. They'd shove the tanks and stuff away from the inlet pipes... For some reason every tank was shoved away from the inlet pipe, and in fact, one year, why they crawled in the tank and stomped the bottom out of it and lost a tank because of that.

Causal conditions for substantive change among ranchers interviewed were commonly suggestions or requirements by the Forest Service or BLM and participation in Holistic Management classes and/or CSU Extension classes, like the Range Management School for Ranchers. Suggestions or requirements by the Forest Service or BLM often resulted in initial corrective changes. These corrective changes were tried on a smaller scale on public range and later expanded to more ground on public and private range, becoming a substantive change to their range management regimes. Necessary to this expansion was recognition of the change's beneficial consequences. This recognition seemed increased when beneficial on-the-ground consequences were coupled with range management knowledge gained from individual experience and Holistic Management or CSU Extension classes. Several ranchers making substantive changes mentioned that many of their ideas for range management changes came from CSU Extension classes and/or Holistic Management.

That's where we started from, was Allan Savory. That's when I first was able to come to class. Since then those ideas are passed on in a lot of other things that CSU Extension Service does, and then the CSU Extension Service has been the other window of ideas. That's what I'd call it, simply because they have been innovative. They get a chance to talk and see a lot of different people, and if you just sit there and listen -- you can attend all the meetings you want -- and sometimes you go to three but if you get one idea, which often times you get more than that, one idea out of three meetings, in my opinion is worth the time and

effort. That's the way a lot of the ideas or things that we think we want to do, that's where I've picked them up.

This reflects Rogers' theory on the innovation-decision process, and the perceived characteristics of an innovation (1995). In the cases examined here, relative advantage, compatibility, trialability, and observability were important when forming an attitude about a range management practice.

Context

A key trait to the context of corrective change was that it was done *as necessary*, and often in spurts, as new needs came up or new resources became available.

I fed hay and the government subsidies on different proteins, which there were cubes, tubs, and blocks... Last year the government, because of the drought and hay lossage, gave me the opportunity to try some different things.

Corrective changes were usually done to maintain the operation on the path it was on, without plans to significantly alter the operational future or factors affecting the future. Corrective changes were targeted modifications, as opposed to the broad-scale changes that characterized substantive change.

Substantive changes required significant investments of time, money, and labor above and beyond those required for daily operation. Substantive changes were broad-scale in their implementation and in their impacts on the operation and tended to be continuous in duration, bringing continual adjustment and tailoring.

We review the whole year at the end of the year, and try to make adjustments for things that didn't work out.

Along with continuity, substantive change usually expanded when met with positive consequences. Many would work toward improvement of their practices,

working for increased efficiency rather than being satisfied with maintenance of status quo.

Oh you're always changing to make things better. You know you just don't quit. There's so many different things you try...

Ranchers making substantive changes also often worked at increasing their ability to control external factors affecting the outcomes of their overall operation management. Several ranchers making substantive range management changes were also making substantive changes in the marketing of their beef or lamb. Rather than traditional commodity selling where they had little to no control over pricing, they instead worked to develop niche markets where they had more power over the price paid for their products.

As far as our cattle go, one thing we're going to try and work on there is finding some way to add value to the cattle and get a little more for them...

He explained later,

You know the bottom line is if we make all of these improvements to our operation to where we can be more efficient and we can raise more beef and better beef and everything else, that's good, but if we can't get any money for it when it's time to sell it, then we're in trouble.

While range use and management on public lands remains unpredictable for most, ranchers making substantive changes in their range management usually worked to lessen that unpredictability and increase their ability to control the direction of their public lands grazing. Most worked on this by fostering cooperative relationships with community members, range conservationists, and/or serving on advisory boards for state wildlife and public lands agencies. One rancher explained,

People have always told us, "You ranchers, you don't know the... voice you have with federal agencies, be it senators or congressmen or legislators or even with the BLM and Forest Service. You don't realize the strength you have there," and no, not until probably the last ten years did I actually realize they do listen more than

we give them credit for listening to something. Nobody's perfect, but they do listen. If we're willing to -- there are those of us who'll stand up and tell them the straight of things.

Another rancher commented,

Almost everything that we do, that's one of the questions we ask is -- you know, how is this going to affect the recreationists or the people that are out there on the Forest? We've found that when we go about it that way, we have a lot less problem with gates being left open and that sort of thing... And we talk to people a lot, try to explain why we're putting in this fence and why it's in this location and why it's in this location rather than someplace else. We do a lot of that. We talk to a lot of different people... Every time you talk to those people you can be kind of antagonistic, but it doesn't get you anywhere you know. It might make you feel good that you told somebody off or that you have more right to be here than they do, or whatever it is you tell them, but you don't get anywhere you know. You haven't taken that person and kind of brought them on your side, and that's what I think we need to do more and more, is try to get people on our side.

Intervening Conditions

Multiple intervening conditions facilitate or constrain ranchers' actions to implement range management change. Most commonly cited obstacles to both corrective and substantive range management change were limited time, money, and labor. However, ranchers making primarily corrective changes shared another common trait. They more often held full-time outside jobs themselves, as did their spouse and other family members. This played heavily in their ability to make changes, as their available time and labor was restricted by off-ranch commitments.

And you got to know that there again, time and ability has a lot to do with it. Because without Grandma here, and B. [daughter-in-law] willing to stand beside her and help her and what not and do most of the physical work with Grandma's support, we couldn't maintain what we're doing now because we all hold full-time jobs. And that's the only way that we can support this place.

Off-ranch commitments were cited as inhibitors to innovation in previous research. Rowan and White (1994) found that Texas ranchers who invested in weed and

brush control had higher proportions of family income from livestock production and less off-ranch income. Innovative ranchers interviewed in Utah were full-time ranchers living on the ranch and were dependent on primarily ranching income (Didier and Brunson 2004). Some of these ranchers noted that because they didn't have to work off the ranch and didn't spend time commuting to and from the ranch, they were able to spend more time on innovations.

Many ranchers commented on the difficulty in finding skilled labor from outside the family.

...We try things that will end up being easier, take less labor ...It's difficult to find people that will work on a ranch, because you know the way we are, it's seasonal... We're not big enough to employ somebody year round and give them all the benefits that they want. So it's difficult to find anybody that would want to work on a ranch.

Several ranchers mentioned that market prices play an important role in their ability to make changes in their operations.

...Seriously, what has to do with changes has to probably more with, like I said, economics. If you're making money, why, you'll do things...The value of lamb, as it is right now the market for lamb is good, and we've had two good years here in a row. So things seem to be looking up, and if it continues another year or two, why, then you got to looking at other options. You feel financially strong enough to do that.

Interviewees felt there was a strong link between public perception and the success of their operations, particularly in regards to market prices and public lands grazing.

...The one thing that's probably ...most devastating is a situation like the mad cow where you have to deal with a public perception situation...And you know, maybe it's not a big deal, but from 90 to 70 cents is a big deal. And who knows when that's going to recover, and it's just like somebody accusing somebody of doing something that they didn't do, the perception is there, and we've lost some beefeaters.

Many ranchers commented on public perception of public lands grazing.

Individuals' response to this pressure varied. Strategies included planning for future alternatives to public forage, like buying or leasing private range, as well as avoiding range management that would look bad to the public.

...I don't think the public overall understand high-impact, short-duration grazing. It looks bad to them. And that's a reality in today's world, whether it's right or wrong or indifferent, it's the reality, what you can and can't do.

Didier and Brunson (2004) described public perception as a concern among ranchers in their study. They explained that these ranchers often innovated to demonstrate good land stewardship to the public and to improve relationships with public land management agencies.

Relationships with public lands agencies play a large role in West-Central Colorado ranchers' aptitude for change. Flexible and cooperative relationships encouraged substantive, sustaining change.

I think we are fortunate in this West Central Colorado that we have a lot of progressive and open-minded federal agents, I'm talking Forest Service, the BLM, and with like this CSU Extension Service, which are primarily the ones in that respect that we deal with here. We've been real fortunate in that way...we don't have as many confrontations between, you know, between grazers and federal agents, but we hear about it in certain other areas.

Another rancher explained,

Well, we've been real fortunate in that the range conservation people have allowed us to make – nothing has been a hard fast rule that we couldn't change. They've given us a lot of latitude in how we do things...Oh, I think it makes an awful lot of difference, because you feel like they're actively involved in the cooperation of it rather than setting mandates ... and when you're managing livestock you know, everything is subject to different scenarios all the time and a lot of people don't really understand that. "This is what you said you would do, how come it didn't happen?" Well, gee I don't know. I haven't thought like all 1056 cows.

Those with doubts over the benefits of substantive change were more likely to feel constrained in their relationships with public lands agencies.

I think sometimes they don't want to listen to um, to experience. They have all these ideas they've learned out of a textbook somewhere and they feel like they have the answer, and they don't – It's like they have set answers for every place, and every place is different and every allotment's different, and sometimes it's pretty tough, because you know you have people that have run cattle for 50 years on an allotment and they've seen it all and they've done it you know, but it's kind of a continual fight...

Individual allotment or private range characteristics also played a role in facilitating or constraining range management change. Factors like size, water availability, topography, and vegetation played significant roles in changes made.

One rancher mentioned issues like topography and water sources as barriers to using alternative rotations or electric fencing on his allotment.

...Our allotment on the Forest is very rough country. It's one of the roughest allotments around here.

His brother added,

It's one of the hardest ones to get to. It'd be pretty expensive to try to fence it and make the water work out.

Climatic conditions brought opportunities for both facilitating and constraining management change. Consistent drought years provided incentive to many to take the leap into extensive water improvements, along with drought assistance money to help finance these changes and others.

The big drought, you know we're in a five-year drought? ...And all of our water tanks and everything had been getting drier and drier and drier. So, 2002, here's this pond early in the spring, it's dry... So I dug a hole there with my backhoe, this one here, and I decided I didn't have hoe enough for what I had to develop. So I hired this big track hoe, and he come out there. We dug down 12 feet, we laid in gravel and perforated pipe... We put in lots of tanks all over. We got five miles of two-inch pipe I buried in the ground that goes – here's the post for the solar panels. This is our storage tank way up on the hill, then we run it back out. It's

12,000 gallons...It took us two years to get completed...Yeah, got a little drought assistance.

With rising real estate values and development, access to private range proved to be a factor in range management changes for some ranchers. As in much of the West, land is valued well above its agricultural production value. This can create both opportunities and obstacles to implementing new range management practices.

Some have been able to sell smaller land parcels for enough money to revitalize their operation and make needed changes in times of trouble.

...This particular parcel of land was a desirable parcel for some other people, and so we sold it ... It put us where we needed to be, and thank goodness ...I thought we couldn't operate without this parcel of land. We're operating just the same – maybe even, well I know we're operating better because we're still in business.

Others recognized opportunities for affordable leases on absentee-owned ranches.

In a way we're kind of taking all these really nice ranches and making them recreation places for ...well, rich people that have a job somewhere else that really don't have time to manage them... But maybe there's a big market for renting ground. I think that that's probably true -- that all those places, they're going to want to rent their ground or have somebody manage it. They're not going to want to bother making their grazing plans and figuring out how they're going to put cows on it and all those details. They just want it to be pretty when they come and see it.

On the other hand, some ranchers explained that relying on private leases can limit their range management change because they are not sure if that lease will be available year to year.

Well, this is a year-to-year lease on this place, so that makes you kind of nervous ... That's a lot of what you do is -- what do you have to work with?

He explained,

I got another place that I want to lease, but the property sold... Yeah, I hotwired it about four or five different ways...I had to do a little bit of permanent fencing...The thing with leased places is the owners are older, they're tired, and

the fences are usually from someone before that leased, and you know they're tore down, and wire's scattered all over, a lot of kinda cleanup stuff, ditch work... Well, that's life.

Wildlife problems were also mentioned as obstacles to range management. Elk in particular were problems for many ranchers interviewed, tearing down fences and consuming forage on "rested" pastures. One rancher said,

...There's fencing that we can hopefully do. The problem with that is the elk tear it up as fast as you can build it.

Another rancher explained,

...The problem we're having out here pressure-wise is with the elk. We're feeding more elk than we have cattle. So that's something we also have to consider when we're stocking those pastures out there.

Additionally, intensifying regulation was perceived by some ranchers as an obstacle to change on their operations.

...It's getting quite difficult you know...I see the government trying to -- or the public or whatever -- trying to make me responsible for somebody dying from mad cow or dying from e-coli or whatever. You know they're trying to put in a system where they can track the animal all the way back from its origin, and to me that means liability, and you know if we get caught in a liability situation, that's when I just send them down the road and say "you people don't want me raising them anymore that's fine with me, buy your stuff from Argentina or Australia or New Zealand or Canada or Mexico and find out how safe it is." I see that as a possibility, you know, we get crowded into a situation where all the regulations and everything else don't match up with the price that we get for our products, that one and losing our federal lands permits is going to be a big whacker.

Relationships with other ranchers facilitated changes in range management for many ranchers interviewed.

Oh, there's a lot of people I talk to for ideas ... Oh, (area rancher) he's pretty knowledgeable on a lot of this stuff. And he's a good one to talk to.

Relationships with other ranchers also provided increased opportunities to learn from consequences of range management practices. One rancher described decision-making within his allotment pool.

Everybody's more aware of their cattle performance. And it helps with making our decisions. It's not just some of us doing it. Everybody can participate... We come up with a lot better plans with everybody knowing what's been going on.

Similarly, Didier and Brunson (2004) found that innovative ranchers in Utah had large social networks and actively sought information about range management. They also maintained frequent interaction with university Extension. Didier and Brunson suggested that frequent interaction with people outside the local community allows ranchers to be more comfortable trying new things than those ranchers who are not commonly exposed to innovative ideas and people. This contact also allows them to observe the outcomes of other ranchers' practices. This is consistent with Rogers' (1995) hypothesis that people are more likely to adopt practices when they can readily observe the results, thus reducing the risk associated with making a change.

Also consistent with Rogers' (1995) description of the adoption process, trialability and reinvention were common among ranchers' implementation of range management ideas. One rancher described how he learned to use electrical fence through his own and other ranchers' trial and error.

That was probably the thing that helped us the most, was that three of us were trying to use it at home and talking back and forth about it. Plenty of failures. I don't have any of the first electric fence posts that I bought. None of them were right. Some of the chargers, the tape, the wire, all that stuff changed how we did it, what we expected out of it. So trial and error and also neighbors' trial and error.

Recognizable consequences were also important to facilitating changes in range management. One rancher explained a newly implemented rotation on his allotment using electric fence. He could see it was making some difference because a lot of cattle trails were gone, but when asked if he thought it had made a difference in recent tougher years, he replied,

It's hard to say, but I can't really see that it's night and day difference. I may not be giving it enough credit, I don't know.

Kreuter et al. (2001) concluded in their study of Texas landowners that "range management technologies that can be easily understood, are inexpensive, and which have relatively rapid and predictable results are more likely to be adopted by land managers than costly or complex strategies with delayed or uncertain responses" (p. 638). Similarly, Coppock and Birkenfield (1999) found that Utah ranchers favored practices that were less complex, had predictable or controllable outcomes, were more cost-effective, and were directly compatible with production goals.

Among ranchers interviewed for this study, having clearly defined goals for their operations facilitated substantive changes. A rancher who had made extensive substantive changes explained the importance of setting clear goals for himself and his operation.

You only get one goal in life and it has three parts. One is your quality of life; one is how you're going to produce that, and what the future landscape needs to look like to support that quality of life that you want. So, I grew up thinking up goals of, you know, I wanted higher weaning weights, I wanted more tons of hay, I wanted – but when you talk about quality of life there's only one, so you decide what that is for you or the group you're working with and work towards that. We did the same thing in [allotment pool], and it helped, but if you don't keep that in front of yourselves and really refer back to it, it loses it's meaning, so it's real important that that's how you go through those stumbling blocks.

Action/ Interactional Strategies

A pattern emerged among interviewees' strategies to incorporate a range management change into their management.

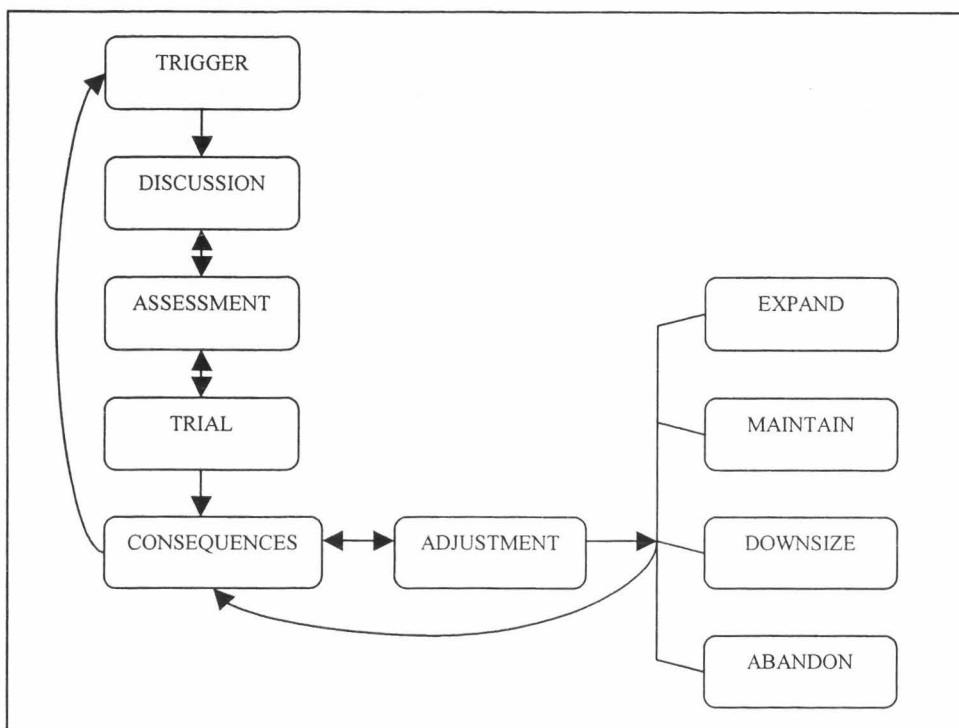


Figure 15. Action/interactional strategies for incorporating range management change.

First, some sort of **trigger** takes place, such as talking with another rancher, reading a magazine article, or attending a workshop. After an idea is triggered, the rancher **discusses** the idea with partners/family members that share range management responsibilities, such as an allotment pool, spouse, or other family members.

Next or simultaneously, a period of **assessment** occurs. During assessment, the rancher seeks out additional information about the idea, often by talking to other ranchers who have tried it, attending classes on the subject, talking to extension or agency

personnel, as well as reading magazines or other material on the subject. After assessing the idea, if the rancher still decides it is a feasible idea, he/she **tries** the practice out.

Meanwhile, the rancher is continually keeping an eye out for information on the practice to reinforce what he/she is doing, or to learn a better way to do it. The rancher is also continually evaluating the results of the practice, perceiving consequences, and determining whether these consequences align with operational goals.

Based on the evaluation, the rancher will **adjust** the practice as he/she learns from his/her own experiences and the experiences of others. The practice may be **maintained, downsized, or expanded.**

This pattern was evident for both corrective and substantive change processes. However, ranchers making primarily corrective changes seemed to talk more of downsizing or abandoning a practice, or maintaining it the way it was, because of perceived negative consequences. These negative consequences were often excessive labor requirements. Ranchers on the other end of the change continuum, those making highly substantive changes, often expanded corrective changes into substantive, larger scale changes.

Consequences

Consequences are key factors in the change process because they act as crucial feedback to the rancher, helping decide future strategies. Ranchers interviewed cited several consequences they recognized as beneficial to their operations.

Indicators of improved animal performance, like increased gain, conception rates, and herd health, were often cited and tied to range management changes. Another benefit often mentioned was more efficient utilization of their range, resulting in better quality and greater amounts of forage. Additionally, most ranchers felt that they were better able to manage for drought because of their changes in range management.

...We kept trying and we made it work, and dollars and cents went into that too. I mean, it made us money. I mean, yeah, it's expensive to do, but it – you figure all the costs, and the drought conditions – it made us money to do it. It was either do it or sell cows, so I mean there was an incentive there.

Ranchers listed large investments of labor, time, and money as negative consequences to range management changes. These were expected by many as initial costs, but if these costs did not diminish or were not perceived as being balanced out by increased benefits, the appeal of the range management change diminished.

One rancher explained,

You look at the time that's spent on the [allotment] and you look at a lot of other range outfits, the other ones are cheaper. So if you're not adding that cost in – so what if you're doing a great job? It's costing you more money.

SUMMARY AND IMPLICATIONS FOR RANGE OUTREACH/EDUCATION

Qualitative interviews showed multiple dimensions to the change process for range management regimes among West-Central Colorado ranchers. Strategies to employ range management change showed a constant pattern across substantive and corrective change; however, individual perceptions and motivations, as well as external conditions and the context surrounding changes, varied among substantive and corrective changes and lead to different outcomes.

Intervening conditions, like development or drought, are common to substantive and adaptive change process both, but the perception of these conditions as either facilitators or constrainers to change are very different. For example, a consequence such as increased forage or reduced livestock losses to poisonous plants may be experienced by two neighboring ranchers trying timed grazing, but very different perceptions might lead one rancher to use timed grazing more extensively and the other to abandon it altogether.

Among ranchers interviewed, it seemed different motivations resulted in different goals, which resulted in different perceptions of consequences. If a practice took away from a lifestyle goal, like having contented family members, then the practice lost its appeal. For example, one rancher explained how after attending Holistic Management classes and learning Holistic Management principles, he worked to build goals for his ranch.

The real important part was going back to the family and getting the basic goal. Where I thought I was going to come home and build fences, I came home and got my son and daughter and wife to talk about what was important in their life. I mean that seems like a long way from building fences and growing grass, but that's really the important part, because you can make all of those mechanical adjustments, but if you don't get the deep down stuff of where you're headed in life with the rest of your family, it isn't so great. And I have seen that split families up, where when they get down to that deep what's important to them they realize they're both going different directions. It's not always good. But in our case it was good.

Intrinsic to realizing ranch goals is the feedback from perceived consequences. Several ranchers seemed somewhat unsure of the benefits and drawbacks of newly implemented practices, other than their initial cost in time, labor, and money.

Increased opportunities for clear feedback encouraged sustained, substantive change among ranchers. These opportunities commonly came from frequent interactions with other ranchers using a similar practice, as well as attendance in the Range Management School and Holistic Management classes.

Interactions with other ranchers using the same practice allowed individuals to gain from multiple sets of "trial and error," and see various indicators of success or failure to compare to their own situation.

The School and Holistic Management classes provided a foundation in range management that ranchers could use to evaluate the quality of their range and trends of improvement or degradation. The Range Management School taught and encouraged monitoring range trends; however, few interviewees did any formal monitoring beyond Forest Service or BLM requirements.

Monitoring could be another way to increase opportunities for feedback. Having information readily available from past years' range quality could help determine not only range trend, but also give a clearer picture of a practices' consequences when compared with other key indicators from animal records, like gain or calving rates or other indicators closely tied with ranch goals.

Much of the feedback mentioned by interviewees had indicators closely tied to ranch goals. With ranch goals most commonly centering on increasing efficiency, increasing profits, and maintaining a ranching lifestyle, indicators like improved animal performance or better forage utilization were crucial to most ranchers' decision-making.

Outreach that emphasizes links between range management alternatives and ranch goals (e.g., increased time-efficiency, profit, and maintaining a ranching lifestyle) may

give ranchers trying changes the reinforcement they need. Ranchers considering changes could get a better idea of how these changes will align with their own goals. Most ranchers stated concerns with range conservation; however, its feedback (negative or positive) is often years in the making. Consequences to profit, time-efficiency and lifestyle are readily felt and, for many, easier to discern.

The Range Management School and Holistic Management classes acted as key motivators for change and are important venues for disseminating range research. Seemingly as important to disseminating range information to ranchers and triggering range management change are Forest Service and BLM range conservationists. These individuals are potentially important, but perhaps largely unrecognized, conveyors of range management change in communities with large areas of public land. Information dissemination and range management change is encouraged by cooperative and flexible relationships between ranchers and agency range personnel.

CHAPTER 5

CONCLUSION AND IMPLICATIONS

The objectives of this study were to identify characteristics of ranchers and ranch enterprises that are associated with decisions to change range management practices and to attend the Range Management School for Ranchers, as well as to identify factors that assist ranchers in making successful adoptions of range management practices.

In the first stage of the study, the mail survey, we specifically sought to understand the characteristics and motivations behind changes in ranchers' range management practices, as well as their use of information sources and an outreach program, the Range Management School for Ranchers.

In the second stage of the study, we worked to expand on survey results into understanding the change process, as well as more detailed accounts of motivations and barriers to change in range management.

Survey respondents were classified as changers or nonchangers based on a question that asked respondents simply if they had tried using range management practices since 1995 that differed from what they traditionally used. Survey results showed several characteristics associated with decisions to change range management, as well as decisions to attend the Range Management School for Ranchers.

Qualitative interviews brought further information on ranchers' range management decisions, and a continuum of change emerged. Ranchers fit along a continuum of those making highly substantive changes to those making only corrective changes, with many ranchers incorporating both into their management.

Qualitative interviews showed that survey questions asking respondents to categorize range management change had only skimmed the surface. Categories of range management change, like changes to grazing rotations or watering system, were all interrelated for most ranchers and much more extensive than what could be portrayed in brief survey responses. Ranchers interviewed described detailed and extensive range management changes that did not come out in the survey, such as new water developments that were components of management intensive grazing that was a component of an overall shift to Holistic Management.

A common change strategy also emerged among interviewees (Fig. 15, Chap. 4). Individual ranchers' perceptions proved to be powerful players in the change process. Ranchers similarly experienced intervening conditions to change like drought and development; however, their individual perceptions of those conditions as facilitators or constrainers of change lead to very different consequences. Intrinsic to ranchers' perceptions of conditions as either facilitators or constrainers were their own goals. If practice took away from a ranch/lifestyle goal, then the practice lost its appeal.

Clearly defined goals among interviewees encouraged substantive change. Many interviewees participated in Holistic Management. Holistic Management emphasizes the importance of making decisions around a holistic goal and monitoring and testing decisions toward that holistic goal (Savory Center 2005). For ranchers practicing Holistic Management, recognizing the consequences of a practice and how those consequences relate back to ranch goals is crucial to their management.

Regardless of whether ranchers participated in Holistic Management, opportunities for recognizable feedback on whether a change was meeting or not meeting

ranch goals were critical to sustaining substantive range management change. Without that feedback, ranchers were unsure of the benefits and drawbacks of newly implemented practices, other than their initial cost in time, labor, and money. Increased opportunities for clear feedback on a range management practice encouraged sustained substantive change among ranchers interviewed. These opportunities commonly came from frequent interactions with other ranchers using the same practice, allowing them to gain from multiple sets of "trial and error" and seeing various indicators of success or failure to compare to their own situation. Other opportunities for feedback came from interactions with Forest Service and BLM range personnel and the Range Management School for Ranchers.

Survey results suggest that the Range Management School for Ranchers acted as a roadmap for change, allowing ranchers to learn specific characteristics of range management practices and how to apply them in their own situations. Interviews showed that the Range Management School also created a common knowledge base among permittees and BLM and Forest Service personnel. The School is attended and/or taught by agency personnel and permittees alike. Both permittees and agency range personnel can leave the School with the same primary range management concepts in mind.

A common knowledge base seemed to foster understanding among permittees of the reasoning behind suggestions or requirements made by the Forest Service or BLM. Also, range management knowledge enabled permittees to incorporate their own ideas into grazing plans for allotments and to make suggestions themselves in the language that agency personnel understand. David Bradford, range conservationist with the US Forest

Service in Paonia, explained that he will accept permittees' changes to grazing plans, but permittees must justify these changes with range science (pers. comm. 2003).

The Range Management School plays a key role in fostering dialogue among permittees and agency personnel. Based on survey and interview data, information dissemination and substantive range management change was encouraged by cooperative and flexible relationships between ranchers and agency range personnel.

Forest Service and BLM personnel are important conveyors of range management change in communities with large areas of public land. Among ranchers surveyed, possession of grazing allotments had a positive effect on ranchers adopting new range management practices. Additionally, Forest Service and BLM personnel were ranked as important information sources among medium and large operations.

While Forest Service/ BLM requirements were not seen as important reasons to change by survey respondents, agency suggestions or requirements did play a role in most interviewees' range management. Among interviewees, agency suggestions or requirements often lead to initial corrective changes. When coupled with recognizable, positive feedback these corrective changes sometimes lead to larger scale, substantive changes.

The change continuum identified in this research suggests that the adoption-diffusion theory may be limited in its application to understanding range management decision-making among ranchers. Adoption-diffusion focuses largely on the individual operator as the decision-maker, emphasizing individual and situational characteristics as constraints on decision-making (Fliegel 1993). Our research showed that ranchers' decision-making was influenced by a complex interplay of multiple external motivations

and barriers to adoption, as well as ranchers' own personal and operational characteristics. Ranchers' operations are tied closely with surrounding biophysical, political, and economic climates; therefore, their decision-making is usually rooted in not only their own preferences but also on the demands of the surrounding climates.

Our research also showed that Forest Service and BLM personnel can be powerful proponents of range management change on public and private lands. Working relationships and dialogue between permittees and personnel encouraged change, while adversarial relationships seemed to discourage substantive change on rangelands.

The partnership between the Forest Service, BLM, NRCS, CSU Extension and area ranchers in an effort like the Range Management School for Ranchers is unique among western landscapes. This unique relationship has fostered the working dialogue experienced by ranchers and agency personnel and implores investigation into the "technology transfer" of such relationships and attitudes among agency personnel and ranchers in other regions.

Our research also provides some insight on future outreach efforts. Framing messages so that they align with operational goals could encourage ranchers to initiate change. Emphasizing links between range management alternatives and common ranch goals (e.g., increased time-efficiency, profit, and maintaining a ranching lifestyle) provides ranchers the necessary information for decisions to incorporate those alternatives into their own operations.

Many outreach tools, like Extension bulletins, emphasize range conservation as the primary goal and publish specific information geared to achieve that goal. Among ranchers interviewed, range conservation is a chief concern; however, its feedback

(negative or positive) is often years in the making. Consequences to profit, time-efficiency, and lifestyle are readily felt and, for many, easier to discern. Outreach materials that incorporate these common ranch goals and link them to range conservation may be more readily applied by most ranchers.

All in all, our research identified important elements of the change process for ranchers in West-Central Colorado as well as key sources for information and ideas. Because of the largely qualitative nature of this study, results are not predictions for other sites. Instead, this is intended as a description of management conditions that worked and did not work in the rangelands of West-Central Colorado, according to the ranchers that know them. Future research is needed to build on this description and explore these conditions elsewhere and perhaps test theories built here with broader, quantitative research.

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APPENDICES

APPENDIX A
MAILED SURVEY

Thank you for taking the time to complete this survey. In the first few questions of this survey, we'd like to know a little about your livestock operation.

1. Do you raise livestock in Western Colorado, or did you in 2002 or 2003?
 - ☐ Yes
 - ☐ No. If you answered no to this question, please return this survey in the enclosed postage-paid envelope. Thank you.
2. What do you produce in your operation? Please check all that apply.

<input type="checkbox"/> Cattle and calves	<input type="checkbox"/> Fee hunting services
<input type="checkbox"/> Sheep and lambs	<input type="checkbox"/> Other. Please explain: _____
<input type="checkbox"/> Hay	_____
3. Where is your operation primarily based?

<input type="checkbox"/> Mesa County	<input type="checkbox"/> Hinsdale County
<input type="checkbox"/> Delta County	<input type="checkbox"/> Saguache County
<input type="checkbox"/> Montrose County	<input type="checkbox"/> Gunnison County
<input type="checkbox"/> San Miguel County	<input type="checkbox"/> Other _____
<input type="checkbox"/> Ouray County	
4. Do your livestock graze on Forest Service allotments?
 - ☐ Yes
 - ☐ No
5. Do your livestock graze on BLM allotments?
 - ☐ Yes
 - ☐ No

In the next few questions, we'd like to know if in recent years you've tried any range management strategies, and if so, how these strategies have worked out for you.

6. Since 1995, have you tried using range management practices (e.g. animal handling techniques, fencing and/or watering systems) that differ from what you traditionally used?

- ☐ Yes. Please go to question #7.
- ☐ No. Please answer the question below.

6a. If you answered no to question #6, why did you prefer not to make changes to your operation? Please check all that apply.

- ☐ I'm content with things as they are.
- ☐ I expect to retire within a few years.
- ☐ Don't know what changes would help my operation.
- ☐ Can't afford the financial cost of change.
- ☐ Can't afford to invest the time needed for change.
- ☐ Other. Please explain: _____

Please skip to question #11, page 3.

7. What changes in rangeland management practices have you made? List up to three of the most important changes you have made in your livestock operation since 1995.

8. Since 1995, have you changed any of the following? Please check all that apply.

- ☐ The frequency with which you move your stock to fresh pasture.
☐ Fencing and/or watering systems you use on the range
☐ Animal handling techniques on the range
☐ The way you monitor the condition of your range

If you answered yes to any of the above, please describe the changes you have made.

9. We know there are many reasons why a rancher may change his or her management practices. How important were the following reasons in implementing changes to your range management?

	Not at all important	Slightly important	Somewhat important	Very important
Improve profitability of my operation.	1	2	3	4
Improve health of rangeland.	1	2	3	4
Improve forage production.	1	2	3	4
Improve wildlife habitat.	1	2	3	4
Improve water quality/ availability.	1	2	3	4
I had to change for financial reasons.	1	2	3	4
I was required to change by the BLM/Forest Service.	1	2	3	4
Other.	1	2	3	4

If you noted *Other*, please explain:

10. Are you still using all of the new range management practices you listed in questions #7 and #8?

- ☐ Yes.
☐ No. Please answer questions 10a-c. →

10a. Which new practices do you <u>no longer</u> use?
10b. Why did you stop using those changes?
<input type="checkbox"/> It took too much time.
<input type="checkbox"/> It took too much money.
<input type="checkbox"/> It didn't fit with my way of life.
<input type="checkbox"/> Other. Please explain.
10c. What practices are you using now?
<input type="checkbox"/> I went back to how I was originally doing things.
<input type="checkbox"/> I tried something different.
<input type="checkbox"/> Other. Please explain.

In the next set of questions, we would like to know what you think about information services for ranchers and how they can be more helpful to you.

11. How important are the following sources to you when making range management decisions?

	Not at all important	Slightly important	Somewhat important	Very Important
Other producers	1	2	3	4
Family members	1	2	3	4
Private consultant	1	2	3	4
Extension agent	1	2	3	4
Natural Resource Conservation Service personnel	1	2	3	4
BLM personnel	1	2	3	4
Forest Service personnel	1	2	3	4
Books, magazines	1	2	3	4
Internet	1	2	3	4
Other.	1	2	3	4

If you noted *Other*, please explain: _____

12. On average, how many times per year have you had the following types of contact with Colorado State University Extension programs or staff?

Called or spoke with my county extension agent.	0	1	2	3+
Had an extension agent visit my ranch.	0	1	2	3+
Visited my county extension office.	0	1	2	3+
Read an extension bulletin, article, or newsletter.	0	1	2	3+
Attended a CSU extension meeting or workshop.	0	1	2	3+

13. Colorado State University Extension offers the Range Management School for Ranchers. The school was developed in 1995 by Gunnison Basin ranchers and county extension and agency personnel like Robbie Baird LeValley (Extension), John Murray (NRCS), Floyd Reed (USFS), and Dave Bradford (USFS). Have you attended the school?

- ☐ Yes. Please go to question #14.
☐ No. Please go to question #13a.

13a. Which statement best describes your situation?

- ☐ I hope to in the future.
☐ I don't have the time.
☐ I haven't heard of it.
☐ I don't think it would help me.
☐ Other. Please explain: _____

14. Did your range management practices change after you attended the school?

- ☐ No.
☐ Yes. Please explain what you are doing differently: _____

15. Education programs must be updated often in order to stay useful. Are there any changes you'd like to recommend in the Range Management School for Ranchers?

- ☐ No, I think it worked out fine.
☐ Yes, I'd like to see the following change(s) in the class itself: _____

- ☐ Yes, I'd like to see the following change(s) or additions in the materials provided to people who attend the class: _____

16. How useful was the school to you?

Not Useful

Very Useful

1

2

3

4

5

Finally, we would like to know more about your background. This information will remain strictly confidential. Feel free to answer only those questions with which you feel comfortable.

17. How old are you? _____

18. How long have you or your family been managing your operation?

- ☐ Less than 1 year. ☐ 25-50 years.
☐ 1-10 years. ☐ 50-75 years.
☐ 10-25 years. ☐ Over 75 years.

19. What is your highest level of formal education?

- ☐ Some high school education.
☐ Some college education.
☐ Graduated college.
☐ Post-graduate education

20. How large is your operation?

- ☐ Less than 50 cows. ☐ Less than 50 sheep.
☐ 50-100 cows. ☐ 50-100 sheep.
☐ 101-300 cows. ☐ 101-300 sheep.
☐ 301-500 cows. ☐ 301-500 sheep.
☐ More than 500 cows. ☐ More than 500 sheep.
☐ Other livestock _____

21. What portion of your household income usually comes from your farming and ranching activities?

- ☐ None.
☐ <10 %
☐ 10-49%
☐ 50-99%
☐ 100%

24. In order to get the best possible information for range and livestock managers and educators, we'd like to do in-depth interviews with livestock producers this coming winter. Would you be willing to be contacted by a graduate student who would ask more about your experiences as a livestock producer?

- ☐ Yes. Please provide your name, phone number, and address below.

- ☐ No. Thank you for taking time to complete this survey. Please return the survey in the enclosed postage-paid envelope.

22. How many years would you estimate that you will continue ranching?

- ☐ Less than two more years.
☐ 2-5 years.
☐ 6-10 years.
☐ Indefinitely, I am getting sufficient returns from my operation to sustain my ranch and make an adequate living in the long run.
☐ Indefinitely, I or my spouse (or both) have sufficient off-ranch income to make an adequate living and offset any losses in my operation.

23. If/when you cease ranching, what do you think will most likely happen to your operation?

- ☐ I don't know.
☐ Another family member will take over.
☐ I or my family will stay on the operation but lease the land to others.
☐ The operation will be sold to a rancher outside of the family.
☐ The operation will be sold for non-agricultural uses.
☐ Other. Please explain. _____

Your ideas are important to us! Please mail your survey in the enclosed postage-paid envelope.

APPENDIX B
INTERVIEW GUIDE

1. Can you tell me a little bit about your ranch?

2. Since 1995, have you made any changes in how you manage your range?
- (If no changes made, go to INSERT A).

3. What have you done that's different from how you were operating before?
- (Go to *INSERT B* have a separate page for each improvement).

4. Do you think the changes you've made have affected your ability to get through tough years like the ones we've had recently? How so?

5. Are there any other changes that you've made in your range management that we haven't talked about yet? Are there any other ideas you're thinking about trying?

6. Speaking generally about changes in your operation, how do you usually first hear about the ideas that you've tried, or are thinking about trying?

7. Where (programs or agencies or people or information sources) have you been able to go to for help in making changes in your operation?

8. Next I'd like to ask about any problems you've had that might have made it more difficult to make a change or prevented you altogether from making a change. What do you think are the primary obstacles to you when trying new ideas?

9. How were you able to work past those obstacles (if you were able to do so at all)?

10. What are the main reasons why you try new things in your operation?
11. Have you ever felt pressured to make changes that you weren't sure you wanted to make? By whom? What changes were being suggested? Did you do them? How have they worked out for you?
12. Finally, I'd like to ask what you see the future being like for your operation. What are your overall plans for the future?
13. That concludes all the questions I wanted to ask. Before we finish our interview, though, is there anything else you'd like to tell me or the scientists or educators I work with?

INSERT A

1. Why haven't you made changes in your range management?

- ☐ *(If because don't need to change, go to #3)*
- ☐ *(If because barrier exists to change, go to #2)*

2. What kind of barriers would you/ have you run into trying to make changes in your range management?

3. If you were to make a change, how would you go about getting information about it?

INSERT B

Rancher _____

Improvement _____

General category (water, grazing system, pasture improvements, monitoring, etc.)

Questions:

- What did you do that was different from how you were operating before?
- Have you seen results from this change? What kind of results have you seen?
- Were the results what you expected?
- How did that process go?
 - Was it relatively easy or difficult to do?
 - Did you find that you knew enough before you started to make the change?
 - Is there anything you wish you had known before you started?
 - Did things go as you expected them to go?
- Are you finished with the changes you plan to make in this aspect of your operation?
- Do you think you'll stick with the new way of doing things for awhile?
- If no: Do you see yourselves trying it again in the future?
- If yes: Do you think you'll ever go back to the ways you've done things in the past?