

Understanding the Social Dimensions and Preferences for Management of Protected Agricultural
Lands

by

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Understanding the Social Dimensions and Preferences for Management of Protected Agricultural Lands

Thesis directed by Associate Professor Nicholas E. Flores

This study examines individuals' preferences for protected agricultural lands. While there are a preponderance of studies quantifying the magnitudes and determinants of support for farmland protection studies rarely examine preferences for post-protection aspects of agricultural lands. However, farmlands are living systems subjected to land use strategies employed by their managers. So even in instances when farmland has been protected in accordance with the public's stated preferences, the actual farmland management strategy employed might not deliver what the public expects. This dissertation seeks to contribute to this gap in knowledge in two ways.

First, I focus on the *back-end* of farmland protection; i.e. the types of preferences individuals have for agricultural lands once they are protected. Second, I explore how individual preferences for protected agricultural lands are products of social interactions. Using Boulder County, Colorado as a case study, I address these questions using semi-structured, in-depth interviews with stakeholders, a general population survey, and a hedonic pricing model.

Findings from qualitative interviews revealed that stakeholders have general concerns about the management aspects for protected agricultural lands and specific concerns about the management plans for protected agricultural lands, about land tenure relationships shaping the management process, and about what property rights the general public acquires when they support efforts to protect agricultural lands.

Findings from the general population survey indicate that respondents are most interested in the non-market amenity benefits often associated with agricultural lands. Moreover, many of the preferences expressed in the survey, suggest that many of the benefits may not require agricultural lands, but may be derived from open space lands. For instance, when respondents support efforts to protect agricultural lands they are more concerned with limiting development (70%) than with limiting the types of farmland practices on protected agricultural lands (28%).

Findings from the hedonic pricing model indicate that homeowners have preferences for living in close proximity to agricultural land that is formally protected. Moreover, the sales price of homes directly adjacent to protected agricultural lands, are on average, experience 6.5% more than the sales price of houses not directly adjacent to protected agricultural lands.

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GLOSSARY OF KEY TERMS

The following definitions will help establish a common vocabulary used in this dissertation.

Farmland: In this study farmland refers to lands that are used for agricultural purposes. Farmland might include cropland, grazing land, ranch lands, or pastures. In addition, farmland may include structures such as farm houses, barns, and greenhouses. Some farmland can also be used for commercial purposes such as roadside stands. Farmlands can also be sources of open space. I use this term interchangeably with the term *agricultural lands*.

Farmland Protection: In this study the term *farmland protection* is used to refer to the institution of protecting agricultural lands. In some instances, it refers to the formal, Federal Farmland Protection Program, an initiative sponsored by the federal government. Farmland protection is also sponsored by State, non-governmental organizations, local governments, and tribal entities. The tools used to protect farmland are varied and range from zoning to fee-simple ownership (see Chapter 3 for more information).

Farmland Valuation: In this study I use the term *farmland valuation* to refer to the body of research examining what people want from agricultural lands once agricultural lands have been protected. More specifically, this body of research has been conducted by agricultural economists with the primary goal of estimating an economic value for different aspects of farmlands using nonmarket valuation techniques.

Nonmarket good: In economics, a nonmarket good is something that is not routinely exchanged on the market. Externalities from farmlands such as scenic landscape and rural character are side effects from farming for which a farmer is generally unable to receive compensation. This is because the farmer cannot exclude you from enjoying the scenic landscape, and in most cases your enjoyment of the landscape does not necessarily preclude my enjoyment of the landscape. For these reasons, the farmer is unable to charge for this good and thus is unable to receive compensation.

Openland: I use the term *openland* in a very specific sense in this study. In Chapter 5, the term *openland* is the name assigned to a variable in a regression model. The variable is a composite of both open space lands and agricultural lands in a specific area.

Open Space/open space: In this study I use the term *open space* to refer to any lands that are devoid of development. When the term *Open Space* is written as a proper noun, I am referring the institution of Open Space Protection. The only instances of this usage are in reference to the Boulder County Parks and Open Space Department.

Preference: In economics a *preference* is defined specifically as a reflection of the utility or well-being an individual derives from a choice. When used in this sense, the underlying assumption is that tradeoffs were made based on the utility one can derive from the choice. Thus, preferences reflect a valuation of some sort. In this study, I use the term in an evaluative sense as well.

Protection: In this study protection is used to refer to the institution of protecting lands. There are multiple tools used to protect lands, therefore when the term *protection* is used, it does not refer to any one type of protection tool used (e.g. conservation easement) but refers to the general process of protecting lands. Moreover, the notion of the word protection suggests that lands are being protected from some other thing. The other thing, most generally is referred to as development.

Protection Status: I use this term to refer to the classification of the lands discussed in this study. These include lands held privately, lands protected with a conservation easement, and lands protected through outright purchase by the County. Thus the status of these lands are private, conservation easement, and publicly-owned respectively.

Public: In this study the term *public* is used in reference to citizens who have supported efforts to protect agricultural lands. In this instance, I use the term to refer to the collection of individuals that have supported protection efforts. I also use the term *public* as an adjective in front of the word lands, such as *public lands*, to refer to lands that are held in trust by a government authority.

Public Lands: Public lands refer to those lands held in the public domain by federal, State, or local governments.

Value: This term is used to refer broadly to the benefits an individual derives from a good. It does not have to be purely an economic value.

CHAPTER I

INTRODUCTION

PUBLIC LANDS AND NATURAL RESOURCE CONFLICTS

Many of us enjoy public lands because of the multiple amenities we derive from them such as scenic vistas, open landscapes, recreational opportunities, and access to natural resources. However, in the United States, conflicts over lands held in the public domain have become the norm (Nie 2008). Growing populations, and the ensuing residential development of rural areas in and around public lands, have propelled conflicts about the availability of and access to natural resources on many public lands (Baron, Theobald and Fagre 2000).

Related land use trends have also contributed to the development of agricultural lands in the United States. Conspicuously, expansions of cities nationwide have resulted in noticeable conversion of agricultural lands at the urban-rural fringe (Delbecq and Florax 2010, Hart 2001, Heimlich and Anderson 2001). At the same time, many of us enjoy agricultural lands because of their multifunctional nature; in addition to providing food and fiber, these lands also provide open space, environmental and ecological services, and often a connection to one's cultural heritage (Bergstrom and Ready 2009, Kline and Wichelns 1996b). Therefore, transformation of agricultural lands for development has triggered concern and conflict over the loss of such lands (Heimlich and Anderson 2001, Theobald 2001).

CONFLICT OVER AGRICULTURAL LANDS

Conflict over agricultural lands has increased more recently because of a collection of dynamics. In addition to urban expansion, in the 1970s social scientists noted marked

demographic changes in the rural countryside in the form of in-migration of exurbanites (Brown et al. 2005, Vias and Nelson 2006). A primary driver of the in-migration has been a rising importance of access to open space and recreational opportunities (Brown et al. 2005), mild climate, varied topography and proximity to surface water such as ponds, lakes, and shorelines (McGranahan 1999) aesthetics such as forested landscapes and beautiful mountains (Brown et al. 2005, Paquette and Domon 2003, Sayadi, Gonzalez-Roa and Calatrava-Requena 2009). As the rural countryside has become repopulated by people in pursuit of lifestyle amenities, the political influence of non-farm and ex-urban interests has increased (Ghose 2004). Subsequently the expectations of the countryside have shifted to reflect this new demographic balance (Heimlich and Anderson 2001, Lenihan, Brasier and Stedman 2009).

Concurrently, in the United States, the agricultural sector has been experiencing weakened political and economic relevance at local and regional levels (Buttel, Larson and Gillespie 1990, Lenihan, Brasier and Stedman 2009, Lobao and Meyer 2001). For instance, economic globalization and trade liberalization have led to real changes in the structure of the U.S. farming sector on both national and regional scales in the last 30 years (Lobao and Meyer 2001, Vias and Nelson 2006) that has resulted in an overall decline in the number of farms; more output being generated from fewer, larger farms; capitalization of farming; and decreases in the amount of total land area in farming (Heimlich and Anderson 2001, Lobao and Meyer 2001). As a result, the total share of employment within agriculture has declined from 15 percent to less than 7 percent since 1970 (Vias and Nelson 2006). Moreover, with less than 1 in 10 rural residents having jobs directly tied to farming, rural economies are no longer reliant on a stable farming sector (Heimlich and Anderson 2001, Lobao and Meyer 2001).

More recently the American public's imagination has been captured by local and organic food movements. This surge of interest is reflected in a 24% increase in farmer's markets between 1994 and 2011 (USDA and AMS 2011); the Hollywood success of movies such as *Food Inc.*(2008), and *The Future of Food* (2004); and the popularity of food author Michael Pollan, author of the books: *The Omnivore's Dilemma* (2006), and *Food Rules* (2009).

Collectively, expanding populations, shifts in the structure of agriculture, changes in the demographic makeup of rural areas, and increased general public interest in food and agricultural related activities, has resulted in a differentiated rural landscape characterized by different claims on land use (Ilbery 1998). Namely, these shifts are contributing to changing ideas about what aspects of agricultural lands are the most valued (Sharp and Adua 2009, Smith and Sharp 2005). In turn, these shifts have called into question the accepted notion that agriculture ought to be the dominant land use of agricultural lands, and that the farmer is the one who is making the land use decisions (Lenihan, Brasier and Stedman 2009, Mather, Hill and Nijnik 2006). Increasingly a varied range of individuals and groups are having a say in what constitutes appropriate agriculture (Lenihan, Brasier and Stedman 2009). Consequently, these conflicts and concerns about agriculture have also resulted in elevating the loss of agricultural lands to a national issue.

PUBLIC PROTECTION OF AGRICULTURAL LANDS

Conversion of agricultural lands to nonagricultural uses prompted public efforts to preserve private farm and ranch lands beginning in the 1960s (NALS 1981). In 1996 the Federal Farmland Protection Program (today called the Farm and Ranch Lands Protection Program or FRPP¹) was established in the Farm Bill (Sokolow 2010). Today, a suite of agricultural support

¹ While the Federal Farmland Protection Program also supports the protection of ranch lands, the name did not initially reflect this. Therefore it was subsequently changed. However, it is still common for studies to refer to

laws and policies are used to protect agricultural lands nationwide (Hellerstein et al. 2002) and generally operate by putting some sort of legal encumbrance on the agricultural land which limits the types of permissible land uses (Owley 2011). The efforts to protect agricultural lands are overwhelmingly supported nationwide (Kline 2006); within the United States, the American Farmland Trust reports there are at least 88 independently funded and 25 state-level farmland protection programs (AFT 2012a, AFT 2012b). Combined these programs have invested over \$3 billion to protect approximately 2.4 million acres of farmland nationwide (Dempsey 2012).

Because government sponsored programs to protect agricultural lands require public support, several research agendas have focused on identifying factors that motivate individuals to support such efforts (Duke and Aull-Hyde 2002, Duke and Lynch 2007, Hellerstein et al. 2002, Kline and Wichelns 1998, Nickerson and Hellerstein 2003).

However, agricultural land protection also requires a lot of *back end* knowledge. As a working landscape, agricultural lands are not homogenous or static. Rather they are cultivated landscapes that will continue to be subjected to agricultural-related land uses post-protection. Thus, management practices employed on the lands post-protection, also largely determines whether the public's demand is being met. Yet very few studies have investigated this aspect of agricultural land protection. For starters, is the public even concerned about the management plans employed on protected agricultural lands or are they satisfied with just knowing that the lands have been protected? If they do have management preferences, (i.e. aspects of agricultural lands that are more valued than others), what are they? Moreover, are there certain characteristics

efforts to that protect both farm and ranch lands as farmland protection. For example, a recent review of the literature is titled: What Have We Learned from Over 20 Years of Farmland Amenity Valuation Research in North America. Similarly, a national nonprofit works "to protect farm and ranch land across America" yet goes by the name: American Farmland Trust. Similarly, in this study, when I use the term farmland, I refer to all types of agricultural lands.

that make individuals more likely to have prefer certain management practices over others (e.g. geographic proximity to farmlands, cultural ties to agriculture)?

Furthermore, given the nature of protection efforts (i.e., a policy about agricultural lands), these studies have generally been investigated by agricultural economists who have generally conceptualized agricultural lands as a collection of attributes (e.g. non-market goods such as ecosystem services) that first need to be identified, and second, need to be valued economically so that public demand can be met efficiently. While providing a wealth of important knowledge regarding the public's preferences for protected agricultural lands (e.g. Bergstrom and Ready 2009; Hall et al. 2004), different valuation approaches estimate different aspects of value (Johnston et al. 2001:306); and traditional farmland protection studies, approached from an economic standpoint, have generally not captured all the ways social factors influence values for farmlands. Specifically, place attachment literature suggests that people value landscapes and places because they develop positive emotional bonds through social and relational acts (Raymond, Brown and Weber 2010, Williams et al. 1992). At the same time, other studies have found that having more nuanced understandings about the ways individuals develop meanings, and thus value, for places through emotional connections offers a way to discover common ground around contested land use issues (Brandenburg and Carroll 1995, Wester-Herber 2004). This sort of understanding about preferences could contribute positively to debates over contested agricultural lands. For instance, how are an individual's preferences for agricultural lands influenced by their social or cultural ties to agriculture? Are individuals that are socialized in a farm or ranch family likely to have different preferences for protected agricultural lands? How might one's interactions (e.g. horseback riding, driving by farms to and from house) with agricultural lands influence preferences?

GOALS

The purpose of this dissertation is to gain more knowledge about individuals' preferences for protected agricultural lands. More specifically, this dissertation is organized around two primary goals.

First, I focus on the *back end* of farmland protection. What types of preferences do individuals have for agricultural lands once they are protected? Is the general public even interested in and/or concerned about the management plans employed on protected agricultural lands? If individuals do have management preferences, what are they? Moreover, are there certain characteristics that make individuals more likely to have certain management preferences (e.g. geographic proximity to farmlands, cultural ties to agriculture)?

Second, I explore how individual preferences for protected agricultural lands are products of social interactions. Are individual's preferences for protected agricultural lands related to cultural and social ties? Does regular interaction with family members or friends in agricultural communities influence an individual's preferences for protected agricultural lands? Is there a relationship between preferences and the level of rural recreational activities an individual participates in?

ORGANIZATION OF DISSERTATION

This dissertation is organized into seven chapters. In Chapter Two I describe the social context and setting for this study. Specifically, I describe the relationship between land use trends and agricultural lands nationwide. I also discuss the contested nature of efforts to protect agricultural lands in the context of broader changes within the agricultural sector. Honing in on the study, I discuss relevant conflicts over public lands in the West. Finally, I present the state of agriculture and agricultural lands protection in Boulder County, Colorado.

In Chapter Three, I review the state of knowledge within the field of farmland protection. I begin by defining farmland protection and the tools used to support such efforts. Next I address how we know what we know about farmland protection. Because this research has largely been the domain of agricultural economists, this discussion begins with an explanation of how economists define, identify, and measure preferences. Further, I discuss critiques to this approach and alternative approaches for evaluating the preferences the public has for protected farmlands. This is followed by a brief review of the empirical findings relevant to this study. Finally, I discuss and compare the three methodological and theoretical approaches used in this dissertation.

In Chapter Four, I present results from a qualitative inquiry that was designed to identify and describe the types of management practices stakeholders prefer from protected agricultural lands. Because I relied on a political ecology framework to guide this analysis, I provide a focused review of political ecology literature, specifically focused on the themes of land tenure, property rights, state capacity, and power. After this, I provide a description of the methods used to collect data for this study. Then I present results and discuss the implications of the findings.

In Chapter Five I present results from a general population survey designed to identify the respondent's level of social, cultural, and geographic ties to agriculture. Additionally, the survey identifies preferences for *back end* aspects of farmland protection.

In Chapter Six I present results from a traditional nonmarket valuation tool commonly used to measure preferences for protected agricultural lands, a hedonic pricing model. In this study, I focus explicitly on the ways that proximity to agricultural lands influences premiums for homes. To do this, I use a GIS-based statistical model and residential sales data from Boulder

County Colorado to measure, in monetary terms, the amenity and dis-amenity impacts of living proximate to agricultural lands.

In Chapter Seven, I summarize the findings from the three studies presented in this dissertation. I also discuss the policy and research implications of these findings.

CHAPTER II

STUDY SETTING AND SOCIAL CONTEXT

Efforts to protect agricultural lands are embedded within broader social concerns about land use changes in the United States. In order to more fully understand factors that shape preferences for farmland management practices it is important to have an understanding of this setting. In this chapter I describe trends and conditions that shaped early efforts to protect agricultural lands in the United States. I begin by describing general land use trends affecting agricultural lands in the U.S. Next, I describe the contested nature of farmland protection to provide insight into the multiple motivations and expectations held by individuals regarding protected agricultural lands. In so doing, I also discuss the ways in which structural changes in the agricultural sector along with re-composition of the rural countryside has contributed to a mix of competing demands for agricultural lands. After this, I hone in on the setting of this case study, Boulder County, Colorado. Because this study is set in the American West, I also briefly discuss the history of Western Land Use, especially the contested nature of public lands and government management. Finally, in the last part of the chapter I introduce describe my case study, Boulder County, Colorado.

NATIONAL LAND USE TRENDS

Agricultural land loss is commonly attributed to the expansion of urban areas at the rural-urban fringe – the transition zone between city and urban areas and the surrounding rural countryside (Bunce 1998, Theobald 2001). Indeed, nationwide, urban development has grown at a rate of 1.60% per year (Theobald 2005), encroaching on land at the rural-urban fringe. Between

1950 and the year 2000, the extent of urbanized areas, defined as areas with more than 1 housing unit per acre, doubled (Brown et al. 2005, Heimlich and Anderson 2001). More dramatically though, the expansion of residential growth into exurban areas – those areas consisting of 1 unit of housing per acre, (Brown et al. 2005) grew at a rate over 7% annually (Theobald 2005). This rate of land development surpassed the rate of population growth by 25% (Theobald 2005). Exurban growth in the form of low-density, residential development scattered outside of cities and suburbs contributes to rural sprawl (Theobald 2005) and poses a greater risk to agricultural land loss than urban expansion (Heimlich and Anderson 2001, Theobald 2005).

Agricultural Land Loss and the Contested History of Farmland Protection

The extent that expanding urban areas and development impact agricultural land loss has been contested for many years (Fischel 1982, Greene and Stager 2001, Hart 2001, Raup 1982) and was the center of a prolonged and “rancorous” debate about a national initiative to protect farmlands in the 1980s (Theobald 2001:544). At this time, estimates of agricultural loss from urbanization ranged from 3 million acres, a figure reported by the National Agricultural Lands Study (NALS) commissioned by the Carter Administration (NALS 1981); 1 million acres, a figure reported by critics of the NALS report (Fischel 1982, Raup 1982, Simon and Sudman 1982); to 6 million acres, a figure based on data compiled from the U.S. Census of Agriculture by a research scientist specializing in land use change (Theobald 2001). To put this in perspective, the United States’ total land area is approximately 2.3 billion acres and land used for all agricultural purposes utilizes about 52% of this this land (Lubowski et al. 2002) [See Table 2.1].

TABLE 2.1 Major Uses of Land in the United States (from Lubowski 2002)

Land Use	Acres	Percentage
Forest-use land	651 million	28.8%
Grassland pasture and Range land	587 million	25.9%
Cropland	442 million	19.5%
Special Uses (parks/wildlife)	297 million	13.1%
Miscellaneous uses	228 million	10.1%
Urban	60 million	2.6%
TOTAL	2.3 billion	100%

Efforts to understand the true extent of agricultural land loss at the urban-rural fringe has been impeded by incomplete understandings of the land-use dynamics, a paucity of data, a lack of clear definitions, and blurring of land-use and land-cover categories (Hart 2001, Lehman 1992, Theobald 2001)². While knowing the exact degree of agricultural land loss is important, since it points to the extent to which farmland protection is even necessary, for this study, it is just as important to understand the nature of debates surrounding early efforts for farmland protection; they point to reasons why individuals are willing to support farmland protection, what individuals might expect from agricultural lands once they have been protected, and why conflict might ensue after the lands have been protected.

Bunce (1998) notes that a primary threat to agriculture in the 1980s wasn't loss of agricultural lands, as much as it was the broader structural shifts happening within the agricultural sector. Over the last 30 years, globalization and economic liberalization has led to

² For instance, data collected by the U.S. Department of Agriculture's (USDA) National Resources Inventory (NRI) dataset report cropland acreage declined from 367 million acres in 2002 to 357 million acres in 2007, a loss of approximately 2.5 million acres per year (USDA 2009b). However, over the same years, data from the USDA Census of Agriculture reported a total of 434 million acres of cropland in 2002 and 406 million acres in 2007, reflecting a loss of approximately 5.6 million acres per year (USDA 2009a). Hart (2001) attributes part of this problem to a poor conceptualization of farmland because the USDA includes woodland in their definition.

real changes in the structure of the U.S. farming sector on both national and regional scales, including an overall decline in the number of farms, more output being generated from fewer larger farms, capitalization of farming, and decreases in the amount of total land area in farming (Broussard and Turner 2009, Mather, Hill and Nijnik 2006, Vias and Nelson 2006). As a result, the total share of employment within agriculture has declined from 15 percent to less than 7 percent since 1970. With less than one in ten rural residents having jobs directly tied to farming, rural economies are no longer reliant on a stable farming sector (Vias and Nelson 2006). These forces have contributed to a weakened political and economic relevance of the agriculture sector in general in the U.S. (Lenihan, Brasier and Stedman 2009).

Lehman (1992) traces the history of farmland protection efforts to the larger environmental movement and to the larger series of initiatives to foster national land use planning during the 1970s (Lehman 1992). During this process, farmland loss became included in claims made by urban reformers supporting national land use planning (Lehman 1992). Although the initiative for national land use planning failed, the idea of protecting farmlands persisted and the initial legislation to protect farmland was framed in terms of a “cropland squeeze” – relying on the intersecting trends of urban and exurban expansion, reports about increasing cropland loss, and concerns about what this meant for food security, nationally and worldwide (Lehman 1992:263). These claims were further bolstered by the environmental movement’s Neo-Malthusian concerns about overpopulation (Bunce 1998). Moreover, given proponents’ ties to the environmental movement, early proponents of farmland protection were also firmly entrenched in ecological conservation and therefore concerned about soil loss and land degradation and more sustainable agricultural practices (Bunce 1998).

On the other hand, opponents argued that farmland protection policies have been motivated and controlled by urban, non-farm interests (Bunce 1998). Challengers have suggested, that at the very least, food security arguments and famine protection claims, used to purport the necessity of farmland protection by portions of the public were a smokescreen for property owners desiring a bucolic view (Simon 1994 in Bunce 1998). Other contend that, in addition to incorrect estimation of the actual rate of agricultural land loss (Fischel 1982, Hart 2001, Raup 1982), conversion of farmland to other uses is small relative to the total agricultural land base in the U.S. and that there is little threat to its productive capacity (Hart 2001, Hellerstein et al. 2002). Interestingly, a majority of agricultural interests were not supporters of early farmland protection efforts. Initially, the American Farm Bureau Federation characterized the movement as “excessive emotionalism and doomsday zealots” (McIntire 1973 in Lehman 1992:260) and the U.S. Department of Agriculture were concerned it would subject rural interests to urban planners who label farmland as undevelopable on maps (Lehman 1992).

Ultimately, efforts to protect agricultural lands were formally recognized as a national issue with the establishment of the Federal Farmland Protection Program in the 1996 FAIR ACT (currently known as the Farm Bill). This program, still in existence today, provides funding to State, non-government organizations, local governments, and tribal entities with existing farmland protection programs (Sokolow 2010). The FRPP is administered through the U.S. Department of Agriculture’s Natural Resource Conservation Service. Specifically, the FRPP supports the acquisition of agricultural conservation easements by providing up to 50% of the fair market value of a conservation easement on privately owned farmlands (Sokolow 2010). Beyond this program, multiple private entities and local governments have established their own agricultural protection programs nationwide. These efforts are overwhelmingly supported

nationwide (Kline 2006); within the United States, the American Farmland Trust reported at least 88 independently funded and 25 state-level agricultural conservation easement programs (AFT 2012a, AFT 2012b). Combined these programs have invested over \$3 billion to protect approximately 2.4 million acres of farmland nationwide (Morrill 2010).

Changing Rural Countryside and Contested Agricultural Land Uses

Changes in the social composition of the rural countryside also have implications relevant to studies about preferences for farmland protection. The 1970s ushered in a time of increased opportunities for personal mobility in terms of commuting, recreating, migrating, and tourism. As a result, people that formerly had little interest in visiting or living in the rural countryside gained access (Lenihan, Brasier and Stedman 2009). Since then, there has been a marked increase in the number of individuals migrating into ex-urban areas driven by lifestyle goals (Hoey 2005); access to amenities such as actual or perceived higher environmental quality and/or cultural differentiation of a place (Glorioso and Moss 2007); and in search of landscape aesthetics (Paquette and Domon 2003).

As the rural countryside has become repopulated by people in pursuit of these goals, the political influence of non-farm and ex-urban interests has increased (Ghose 2004, Lenihan, Brasier and Stedman 2009). Consequently the expectations of the countryside have shifted to reflect this new demographic (Lenihan, Brasier and Stedman 2009, Mather, Hill and Nijnik 2006) and conflict between farm and nonfarm interests has ensued (Centner 2002, Libby and Sharp 2003, Sharp and Smith 2004). In particular there has been a marked increase in conflict about nuisances – those activities and land uses that are commonly associated with agricultural production: emissions of odors, noise, by-products, wastes – but are considered offensive to surrounding property owners (Centner 2002). As a result, some claim that while the loss of

agricultural lands to development may seem like the obvious threat to farmlands, the real threat to agriculture is conflict about types of agricultural practices are acceptable (Sharp and Smith 2003), especially when nuisance claims by neighbors result in financial loss for farmers (Centner 2002).

Land Use Trends in the Rocky Mountain West

The Rocky Mountain West (RMW) has experienced population growth well above the national average (2.5 times the national growth rate) for the past 50 years (Brown et al. 2005, Leinwand et al. 2010). This is set against a backdrop where approximately 49% of the land is federally owned (Vias and Carruthers 2005). In contrast, about 22% of all the land in the U.S. is federally owned. The extent of federally owned lands in the RMW intensifies residential development land use; between the years 1982 and 1997 there was a 30 increase in developed lands (Vias and Carruthers 2005). Given the prevalence of publicly owned lands in the West, agricultural lands are often the only land available for new urban development (Inman and McLeod 2002). Moreover, the in-migration of people to the RMW is attributed to people seeking its abundant scenic areas and temperate climate (Vias and Carruthers 2005). More specifically, the in-migration of people to exurban areas within the RMW has been motivated by a rising importance of access to open space and recreational opportunities (Brown et al. 2005, Ghose 2004, Gosnell and Abrams 2011); desires for mild climates and proximity to surface water such as ponds, lakes, and shorelines (McGranahan 1999); and aesthetics such as forested landscapes and beautiful mountains (Brown et al. 2005, Gosnell and Abrams 2011). These trends suggest that the social composition of the ex-urban rural areas in the RMW are most likely a mix of residents, some of whom were motivated to live there for aesthetic reasons such as access to open spaces or other environmental amenities.

Western Land Use, Management, and Conflict

Because this study takes place in Colorado, it is also embedded within the history of Western Land Use where more than 45% of the lands in the 11 contiguous western states are owned by the federal government, compared to only 4% of lands in the other states (Gorte et al. 2012). While the federal government has always owned a significant amount of western land, the extent to which it has actively acquired, retained, disposed, and conserved lands has not been consistent (Clayton 1980). Markedly, following several decades of disposing of public lands through policies such as the Homestead Act of 1862, the federal government embarked upon a period of preservation and withdrawal (Clayton 1980, Mollison and Eddy 1982). Most notably in 1976, the Congress, in The Federal Land Policy and Management Act of 1976 (FLPMA), articulated a policy that placed the federal government in a role of active management and regulation of public lands. Moreover, the FLPMA also stipulated that the remaining lands would remain in federal ownership (Clayton 1980, Mollison and Eddy 1982).

As a federal land use policy limiting the capacity of many Western states to utilize millions of acres of land, the FLPMA “brought to boil all the tensions simmering in the West” and spawned the Sagebrush Rebellion, a political movement pitting states’ rights advocates against federal powers (Mollison and Eddy 1982:103). The rebels, those against the FLPMA, sought to wrest more control of federally owned lands and place it in the hands of local authorities. Management issues were at the fore of the rebels’ complaints, specifically a goal was to gain ownership of the public lands in their states. However, Clayton (1980) contends that this was a misguided approach, and that they would have been better served if they sought control over the public land management decision process. In 1989 another challenge against federal authority over the federal lands in the West emerged, the Wise-Use movement (Perry 1996). Similarly, members of the movement sought increased rights in private property.

As conflicts about property rights and control over the management of public lands, the Wise Use Movement and the Sagebrush Rebellion provide important contextual history to present-day understandings about preferences for protected agricultural lands. Specifically, the agricultural lands that are the subject of this study, are public lands held in trust by a government entity: Boulder County, Colorado. Moreover, in Boulder County, like most of the West, a considerable amount of land is publicly held. In sum, approximately 68% of the land is publicly held by either the County, municipalities, the U.S. Forest Service, and the Bureau of Land Management (League of Women Voters of Boulder County 2011).

BOULDER COUNTY CASE STUDY

Case Selection

The community chosen for study was Boulder County, Colorado. Three factors contributed to this decision. First, Boulder County has an extensive and notable history of farmland protection (Miller and Wright 1991). Out of a total of 107,629 agricultural acres in Boulder County, 44,970 acres (approximately 42%) are protected (Stewart 2008).

Second, in the summer of 2008, Boulder County created a Food and Agriculture Policy Council (FAPC). During the July 2008 FAPC meeting, the chair of the FAPC and the county extension agent announced to the council that the county commissioners were interested in seeing more local food produced on county lands and that they would like the FAPC to work on policies to further this interest. Although the County has a notable history of farmland protection, at the start of my study, they lacked policy regarding post-protection management of the farmlands they protect, including any policy guiding the production of local foods (Stewart 2008). Thus, this recommendation from the County Commissioners constituted a new idea that was debated at the FAPC meetings over the next three years.

Third, in 2009 two policy conflicts emerged regarding the management of the protected farmland in the county. The first conflict involved a proposed land-use change on a 60-acre parcel of protected farmland. The proposed change involved sub-dividing a piece of previously fallow land into smaller plots to be leased by farmers wishing to grow produce for the local foods market. After some members of the surrounding neighborhood voiced concerns about the land use change, a public hearing was held to resolve the issue (Georges 2009, Lewis 2009, McVey and McVey 2009). Later in 2009, a debate about genetically modified (GMO) seeds arose after a group of eight farmers requested permission to use GMO sugar beet seeds on the protected farmland they leased from the County. Both of these debates represented conflicts between the public's preferences for specific farmland management practices and proposed management practices.

Fourth, by attending the FAPC meetings since their inception in 2008 through 2011, I developed ties with county officials in charge of the protected farmlands and with other stakeholders in community holding interests in the post-protection management of the farmlands. I utilized these relationships to gain access to key stakeholders. Combined, these public discussions about protected agricultural lands in the County provided a number of public meetings, including public hearings, to attend and learn about the management of the protected farmlands.

STUDY COMMUNITY

Boulder County, Colorado is located on the Front Range of the Rocky Mountains, covers 742 square miles, and has a population of 299,378 (U.S. Census 2011). It is the 6th most populous of the 64 counties in the state. Approximately 36% of the land in the state is federally owned. The City of Boulder is the county seat. According to the 2007 Agriculture Census

Boulder County has 746 farms and 137,668 acres of land in farms; a 1% increase in number of farms and a 22% increase in farm acreage since 2002. Fifty-three percent of the farmland is pasture and 40% is cropland [See Table 2.2]. Twenty-five percent (33,871 acres) of the county's farmland is irrigated. The average farm size is 185 acres and the most prevalent (45% of the county's farms) farm size ranges between 10-49 acres. There are 24 (3%) farms that are 1000 acres or more. (USDA 2007)

TABLE 2.2 Agriculture in Boulder County

Farm Characteristics		Top Crop Items	
Number of Farms	746	Forage	26,451 acres
Land in Farms	137,668 acres	Wheat for grain	4,620 acres
Average Size of Farm	185 acres	Corn for grain	2,499 acres
		Barley for grain	1,337 acres
		Corn for silage	971 acres
Market Value of Products Sold			
Crop Sales	\$25,993,000		
Livestock Sales	\$8,044,000		
Average Per Farm	\$45,425		
Total	\$34,037,000	(ranks 29 th in state)	

Farmland Protection in Boulder County

In 1978, the citizens of Boulder County adopted a Comprehensive Management Plan in order to channel growth to the cities, protect agricultural lands, and preserve the environmental and natural resources within the county (BCLUD 1999). Moreover, the Comprehensive Management Plan stipulates that “it is the policy of Boulder County to promote and support the preservation of agricultural lands and activities within the unincorporated areas of the county, and to make that position known to all citizens currently living in or intending to move to this area” (BCLUD 1999:78). The Plan also states that Boulder County will: “encourage preservation and utilization of lands of local, state and national agricultural importance” and “foster and

encourage varied activities and strategies which encourage a diverse and sustainable agricultural economy (BCLUD 1999:78).

In 1993, the citizens of Boulder County approved for the first time a 0.25% sales tax amendment to pay for the acquisition of open space, including agricultural lands (Resolution NO. 93-174). Since then, the citizens of Boulder County have approved additional sales tax resolutions to support the acquisition of farmland (Resolution NO. 99-11, Resolution NO. 2004-86, Resolution NO. 2010-93). The government agency tasked with managing the protection of agricultural lands is the Boulder County Parks and Open Space Department (hereafter referred to as County). Today the County has purchased the fee-simple ownership in 25,154 acres of the agricultural lands within and has worked with landowners to conserve 19,164 acres of agricultural lands through conservation easements [See Table 2.3].

TABLE 2.3 Protected Agricultural Land in Boulder County

Ag Acres in Boulder County		Acres	%
	Cropland	54,065	50.3%
	Rangeland	53,564	49.7%
	Total	107,629	100%
 Protected Ag Acres in Boulder County			
	County Owned	25,806	24.0%
	Conservation Easement	19,164	17.8%
	Total	44,970	41.8%

Management Plan for Protected Agricultural Lands

While the County has protected agricultural lands through both conservation easements, and fee-simple ownership, at the start of this study, the County did not have a formal management plan in place for any the agricultural lands it had protected. They did have an informal plan in place for the lands they had protected through outright ownership, described

below. In terms of the lands protected through conservation easement, it is generally accepted that the private landowner maintains the rights to make management decisions on lands protected through conservation easement.

In terms of the publicly-owned agricultural lands, the County had an informal plan that the County described as a plan where they manage the lands in “partnership with local farmers” (Stewart 2008). The backbone of this plan was a lease program the County administered for the 25,154 acres of agricultural lands owned outright. In 2012 Boulder County leased 120 parcels to 68 tenants. The County offers two kinds of leases, a crop share lease and a per acre lease. Crop share leases are designed so that the County and tenant each pay a share of the cost of inputs and proceeds from the crop. Crop share leases are typically used on row crop and intensively managed agriculture parcels. The County adopted this type of lease as a way to share some of the inherent risks of farming with the lessees. Crop share ratios range depending upon the crop (Stewart 2008).

Per acre leases are primarily used for rangeland that is used for pasture or grazing and for farmland used for growing small vegetable crops or crops for livestock operations (Stewart 2008). In some instances the lease terms are based on an animal unit per month term. The per acre leases on small vegetable production parcels are priced under market rate. The County charges a maximum of \$100 per acre for small vegetable operations whereas market rate fluctuates around \$250 per acre (A. Card, personal communication, Nov. 2009).

The County follows a basic protocol when administering leases. The majority of the leases are for 3 years. The County does offer extended lease terms (up to 5 years) for organic growers to incentivize organic production. Parcels that are up for renewal are advertised in local newspapers and interested parties are required to attend a pre-bid meeting. Prior to bidding the

County provides interested parties information describing the revenues the parcel should be able to generate. The County evaluates bid proposals based on 3 criteria. The County's primary concern is whether the lessee will provide the best stewardship of the land including management practices that conserve the soil, water, rangeland and other natural resources associated with the property. The second criterion the County considers is the dollar amount of the bid. The final factor considered is the willingness of the prospective tenant to work well with the POS staff to manage the property. However, an important exception to this rule is when the County has acquired land from a local farmer who wished to continue farming the land. In this instance, it was agreed that the farmer could *lease-back* the land from the County and continue farming the land the way it always had (Stewart 2008).

Conflict about Public Agricultural Lands

In 2009, two policy conflicts emerged within the County regarding the management of the County-owned agricultural lands in the county. The first conflict involved a proposed land-use change on a 60-acre parcel of protected farmland. The proposed change involved subdividing a piece of previously fallow land into smaller plots to be leased by farmers wishing to grow produce for the local foods market. After some members of the surrounding neighborhood voiced concerns about the land use change, a public hearing was held to resolve the issue (Georges 2009, Lewis 2009, McVey and McVey 2009). Later in the same year, a debate about genetically modified (GMO) seeds arose after a group of farmers requested permission to use GMO sugar beet seeds on the protected farmland they leased from the County. Both of these debates resulted in a series of public hearings in which hours of public testimony were given. However the GMO debate was notably more resource intensive. Between 2009 and 2011 the

County organized 30 public outreach opportunities including a stakeholder listening session, two open houses, farm tours, a public meeting, County Commissioner hearings, a joint study session of the Parks and Open Space Department and Food and Agriculture Policy Council, and Cropland Advisory Group (which met bimonthly for 12 months) (Rounds 2013). The final public hearing where the general public allowing the public to testify regarding the County's final decision about the future of the Cropland Policy lasted 9.5 hours.

The existence of these debates indicate that at least some members of the general public have preferences regarding management plans on these lands, and that they are finding ways to voice them. In other words, this finding suggests that the public isn't only concerned with which parcels are being selected and which attributes they possess (i.e. scenic vistas, wildlife habitat); but that they are also concerned about how the lands are going to be managed once they have been protected. This has important implications for both practice and research within farmland protection including the legitimization of non-farm actors role in farmland management decision making; a shift in decision making authority away from farmers to a broader audience; and the redefinition of the scope of farmland protection.

SUMMARY

The preferences individuals have about agricultural lands in Boulder County, Colorado are not shaped in a vacuum. Likewise, the factors shaping the debates regarding the conflict about the agricultural lands in the County are also part of a larger social context including a conflictual history of Western public land ownership and management; exurban development that is reshaping the demographic makeup of rural America; contested notions about agricultural land loss; and structural changes within the agricultural sector.

CHAPTER III

PREFERENCES FOR FARMLAND PROTECTION: A LITERATURE REVIEW

In this chapter, I review the literature that is relevant to farmland protection. To do this, it is important to have an understanding of farmland protection in general as well as an understanding of how preferences for farmland protection are generally identified and measured. Thus, the chapter begins with a definition of farmland protection and the tools used to support such efforts. Next, I explain how researchers generally define, identify, and measure preferences. Then I present a review of the relevant existing knowledge about preferences for protected agricultural lands. After this, I discuss gaps in this literature, paying attention to how these gaps are in part related to the methodological approaches used to identify preferences for protected agricultural lands. Next, I describe alternative approaches for evaluating the preferences the public has for protected farmlands, focusing specifically on the approaches used within this study.

PROTECTING FARMLAND

Nationwide, State, non-government organizations, local governments, and tribal entities have established practices to prevent the development of agricultural lands (Sokolow 2010). Annually, farmland preservation programs work to protect the long-term viability of agriculture through a variety of programs and legislative initiatives. These efforts have resulted in a suite of agricultural support laws and policies including zoning to isolate incompatible land uses or to limit the density of residential development; differential tax assessment whereby farmland is taxed at its agricultural value rather than development value; the creation of regions of preferred

and protected land use such as agricultural districts and urban growth boundaries; the purchase of development rights preventing non-agricultural development of the lands in perpetuity; and through outright purchase of agricultural lands (Hellerstein et al. 2002). In this study, farmland protection is used to refer to agricultural lands (including farm and ranch lands) that have been protected by the county government using such practices. Specifically, the agricultural lands that are the subject of this study have been protected through two common agricultural support laws: conservation easements and fee-simple ownership that are held in trust by the Boulder County.

Conservation easements are one of the most popular tools used to protect agricultural lands (Parker 2004). Conservation easements are predicated on the recognition that agricultural land is more than just a physical parcel of land. Rather, by making a legal distinction between the development rights associated with a parcel of agricultural land, individuals and groups of individuals such as land trusts or local governments, can procure partial interests in land through the purchase of conservation easements. Legally, conservation easements are defined as non-possessory interests in land that limits a landowner's activities, beyond what local laws already allow, in order to yield a conservation benefit (Owley 2011). In the context of agricultural lands, conservation easements generally prohibit the subdivision or commercial development of the land while permitting agricultural uses (Parker 2004). The statutes outlining the permissible land uses are guided by state laws, the landowner, and the land trust or local government procuring the conservation easement. However, through the conservation easement, the holder of the conservation easement is granted the right to enforce the terms of the conservation easement and ensure that landowners are complying with restrictions dictated by the easement (Owley 2011). Thus, when conservation easements are used as a means to protect agricultural lands, the landowner maintains ultimate management responsibilities of the land, while the limitations

stipulated about permissible land uses and management practices are negotiated among the landowner and local government during the process of purchasing the conservation easement.

Fee-simple ownership is another tool used to protect agricultural land. In this instance local governments or private land trusts conserve the agricultural land by acquiring the full property interest in the land (Parker 2004). When the fee-simple interest in agricultural lands are purchased by local governments, the management responsibilities, or rights, then fall under the purview of the local government. Because agricultural lands protected through fee-simple ownership are held by the County, they are considered publicly-owned lands. In this study I use the terms *publicly-owned farmlands* and *County-owned farmlands* interchangeably to refer to lands that the County has purchased the fee-simple interest in.

Whether local governments protect agricultural land through fee-simple ownership or conservation easements, the lands are owned on behalf of its people and therefore when the local governments exercise authority over the lands, they are subject to the public interests (Rangan and Lane 2001).

STATE OF KNOWLEDGE

Identifying and Measuring Preferences: Nonmarket Valuation

The methodological approaches used to define, identify, and estimate preferences for protected agricultural lands and the corresponding philosophical orientations undergirding the methodological approaches shape the type of knowledge we have about the public's preferences about farmland protection. Generally, preferences for protection have been measured, evaluated, and discussed in economic terms by agricultural economists and a well-developed literature examining the value of agricultural amenities exists (Bergstrom and Ready 2009). Because

agricultural amenities have a nonmarket public goods nature, nonmarket valuation techniques have been used to determine the value of the different agricultural amenities. The underlying theory of nonmarket valuation studies is based on two fundamental premises of neoclassical welfare economics. First, economic value is defined as a measure of its contribution to human well-being or to the utility of individuals (Freeman 2003). In the context of policy evaluation, “well-being is defined as the individual’s preferences and their willingness to pay for gains or to accept compensation for losses associated with different policy alternatives” (Freeman 2003:6). The second premise is that individuals act in their self-interest. Thus, an individual’s preference when faced with alternative policy options is the basis of valuation.

Nonmarket valuation studies typically elicit the economic value of preferences in the context of an individual’s willingness to pay (WTP) for agricultural land protection. The notion of WTP can be defined as the amount of money represented by the consumers’ surplus before and after protecting agricultural land, or the maximum sum of money a consumer is willing to pay rather than do without agricultural land protection (Freeman 2003). Because agricultural land is not a singular good but a collection of attributes or characteristics (e.g. land, scenic beauty, ecosystem services, etc.), WTP studies seek to first identify the variety of agricultural and ecosystem attributes associated with the lands, and second to estimate an economic value (WTP) for each attribute. According to economic theory, protecting agricultural land increases an individual’s opportunity to enjoy the agricultural amenities and an individual’s WTP or demand to protect it from development therefore represents their preferences and values for maintaining opportunities for enjoying the agricultural land and the amenities associated with it (Bergstrom and Ready 2009).

Preferences for Farmland Protection in the United States

Factors Motivating Support of Farmland Protection

To date, farmland protection studies have focused chiefly on quantifying the magnitudes and determinants of support for agricultural land protection, what I call the *front end* of protection. In a review of farmland amenity research Bergstrom and Ready (2009) found evidence that the total value for farmland protection increases with the quantity of acres protected (e.g., Johnston and Duke 2007; Ready, Berger, and Blomquist 1997; Rosenberger and Walsh 1997); that marginal willingness to pay (WTP) for farmland protection in a given location decreases as protected acreage increases (e.g., Rosenberger and Walsh 1997); and that WTP for small or incremental changes in farmland protection is higher in areas where farmland is more scarce (e.g., Johnston and Duke 2007; Ready, Berger, and Blomquist 1997) but decreases when other nonfarm, rural lands are abundant (e.g., Irwin, Nickerson, and Libby 2003).

Income, age, and education have been found to increase demand for farmland protection (Beasley, Workman and Williams 1986, Irwin, Nickerson and Libby 2003, Kline 2006). Kline and Wichelns (1998) found a positive relationship between respondents with environmental attitudes and higher preferences for the protection of lands that have beaches, ponds, rivers, wetlands, and woodlands. In contrast, respondents with agrarian attitudes held higher preferences for preserving all types of agricultural lands (Kline and Wichelns 1998).

Biophysical Preferences for Land Use

Investigations about preferences for farmland protection have also focused on identifying which biophysical attributes the public most values from agricultural lands. For instance, studies have identified preferences for growth control, nonmarket agricultural amenities, open space

provision, and protection of scenic views (Bergstrom and Ready 2009, Duke and Aull-Hyde 2002, Kline and Wichelns 1996b, Kline and Wichelns 1998, Nickerson and Hellerstein 2003).

Studies have also identified the relationship between preferences for proximity to different types of agricultural operations. In general studies have found that close proximity to large animal operations lower home values (Herriges, Secchi, and Babcock 2005; Kim and Goldsmith 2009; Milla, Thomas, and Ansine 2005; Ready and Abdalla 2005). On the other hand, Metz (2010) found that home sales prices were positively and significantly impacted by being directly adjacent to any type of open space (which included agricultural lands) and that homes adjacent to protected land was valued three times more than similar homes adjacent to unprotected land.

Related to proximity, some studies suggest that some level of access is generally preferred but that trade-offs vary by the type of access and by the attitudes of the people using the preserved land (Duke and Aull-Hyde 2002; Johnston and Duke 2009; Kline and Wichelns 1998; Metz 2010). In a meta-regression of farmland choice experiments Johnston and Duke (2009) found that both moderate and high levels of access to farmland was preferred to farmland without access. Kline and Wichelns (1998) found that preferences varied according to an individual's attitudes; environmentally-minded respondents preferred preserving land without access while the aesthetically-minded respondents had stronger than average preferences for lands with public access (Kline and Wichelns 1998).

Management-Related Preferences

Few studies address the public's preferences for the post-protection management aspects of farmlands. In a notable exception, Inman and Mcleod (2002) found that full-time residents in

a Wyoming county were more likely than part-time residents to support private land management when compared to public management. They also found that the magnitude at which full-time residents supported private management solutions was greater than the magnitude at which landowners in general (including both full-time and part-time residents) supported solutions that included public involvement (Inman and McLeod 2002). From this, the authors surmise that full-time resident status also provides opportunities for greater levels of community connectedness that could influence problem-solving and hence preferences for public involvement.

A more recent study investigated preferences for three different land management practices on an unprotected agricultural parcel near an urban area (Duke et al. 2012). The authors found that respondents were most supportive of management practices that expanded riparian buffers and the use of a fertilizer-like material when compared to the use of no-till cropping, a management system that reduces soil erosion but does require use of more herbicides than traditional methods. Interestingly, the study found that overall, estimated benefits of all three management practices combined were similar in magnitude to just protecting farmlands alone (Duke et al. 2012).

FARMLAND PREFERENCES: GAPS WITHIN OUR KNOWLEDGE

Despite over 20 years of research identifying benefits derived from protected agricultural lands (Bergstrom and Ready 2009), two significant areas are undeveloped. First, research has prioritized quantifying the magnitudes and determinants of support for agricultural land protection, what I call the *front end* of protection. This, in part, makes sense. The notion of using public money (e.g. generated via voter-approved sales taxes and bonds) to protect farm and ranch lands requires public support, thus prompting research agendas seeking to understand what

motivates individuals to support such efforts (Dorfman et al. 2009, Inman and McLeod 2002, Kline 2006, Nickerson and Hellerstein 2003). This involves a lot of *front end* knowledge including identifying which farmland attributes the public values (Hellerstein et al. 2002, Irwin, Nickerson and Libby 2003, Ready and Abdalla 2005), what goals the public has in mind when they vote to support farmland protection efforts (Nickerson and Hellerstein 2003), who is most likely to support such efforts (Kline 2006) what protection tool is preferred (Duke and Lynch 2007, Johnston and Duke 2007, Volinksiy and Bergstrom 2007), and which valued farmland amenities require agricultural lands rather than just rural lands (Hellerstein et al. 2002, Kline and Wichelns 1996a).

Agricultural land protection also requires a lot of *back end* knowledge. As a working landscape, agricultural lands are not homogenous or static. Rather they are cultivated landscapes that will continue to be subjected to agricultural-related land uses post protection. For example, an active piece of farmland has the potential to generate both positive externalities (amenities) such as scenic landscapes and negative externalities (dis-amenities) such as odors or noise (Bergstrom and Ready 2009). The land use practices employed on agricultural lands, post-protection, also largely determines whether the demand will be met. For this reason, management practices employed on the lands post-protection, also largely determine whether the public's demand is being met and therefore deserves more research attention. Yet very few studies have investigated this aspect of agricultural land protection. For starters, is the public even concerned with the management plans employed on protected agricultural lands or are they satisfied with just knowing that the lands have been protected? If they do have management preferences, what are they? Moreover, are there certain characteristics that make individuals more likely to have

certain management preferences (e.g. geographic proximity to farmlands, cultural ties to agriculture)?

A second challenge within the field of farmland protection studies is epistemological. The primary way preferences for protected agricultural lands have been identified and understood is through a utilitarian framework. Because a “commodity approach” (Williams et al. 1992:30) has dominated farmland protection studies, agricultural lands have generally been treated as collections of attributes (e.g. non-market goods such as ecosystem services) that first need to be identified, and second, need to be valued economically so that the demand can be met efficiently. This is related, in large part, to the fact that farmland protection studies have been dominated by agricultural economists who approach questions about agricultural lands, and the public’s preferences about agricultural lands, from a utilitarian philosophy. While providing a wealth of important knowledge regarding the public’s preferences for protected agricultural lands (e.g. Bergstrom and Ready 2009; Hall et al. 2004), different valuation approaches estimate different aspects of value (Johnston et al. 2001:306) and traditional farmland protection studies, approached from an economic standpoint, have generally not captured all the ways social factors influence values for farmlands.

Within the broader field of natural resource management, the “commodity approach” has been critiqued. Williams and others (1992) argue that such an approach reduces settings (i.e. farmlands) to substitutable attributes that are valued as a means rather than as an ends. In the context of management of resources, commodity-based understandings of natural resources privilege the physical characteristics of a landscape over the ways that values are socially constructed through social interactions (Tuan 1977, Williams and Stewart 1998). Yet the use of natural resources is an inherently social process made up of actors trying to secure access to

goods (Nygren 2000). Others contend that the commodity approach lacks the space for including the ways in which relationships between people and places (Raymond, Brown and Weber 2010, Wester-Herber 2004, Williams et al. 1992), symbolic meanings of places (Carolino 2010, Greider and Garkovich 1994, Nogue and Vicente 2004, Williams et al. 1992, Williams and Stewart 1998), and affective experiences with places (Trentelman 2009, Williams et al. 1992, Williams and Vaske 2003) influence value for places and landscapes (Trentelman 2009, Williams et al. 1992, Williams and Vaske 2003).

Similarly, within farmland protection research, there has also been a lack of studies addressing the ways individual preferences for farmlands are related to social and cultural factors beyond specific farmland attributes. Farmland protection studies have been the domain of agricultural economists (e.g. Bergstrom and Ready 2009) and have therefore mostly been approached from a well-established utilitarian logic. However, farmlands are valued by individuals in ways not completely captured by this approach (Williams and Vaske 2003). Preferences for farmland reflect values that people have for a particular landscape that are shaped in a social context (Berry 1976, Zube 1987) made up of interactions with people, with places, and with people and places (Trentelman 2009, Williams and Stewart 1998). Previous studies have found that emotional bonds and positive feelings develop between individuals and the environment over time and that these attachments to place are linked positively to length of residence, and experience use history (Brown and Raymond 2007, Raymond, Brown and Weber 2010, Williams et al. 1992). For instance, an individual's social and cultural ties such as their farming heritage or the extent to which they regularly interact with individuals in the farming community may also influence their preferences for certain land uses associated with protected

farmlands. Likewise, Sharp and Adua (2009) identified a strong positive relationship between individuals who participated in rural recreation activities and support for farmland protection.

Summary

These two gaps in the farmland protection literature are not unrelated. The methodological approaches used to define, identify, and estimate preferences for protecting agricultural lands and the corresponding philosophical orientations undergirding the methodological approaches shape the type of knowledge we have about farmland preferences. For several years, research has been driven by questions seeking to address how best to motivate individuals to support protection efforts. Given that farmland protection is a policy devised to protect agricultural lands, this research has been the domain of agricultural economists who measure preferences from a utilitarian framework. Thus, many of these research endeavors have conceptualized preferences for agricultural lands as collections of goods that are primarily biophysical in nature rather than relational. While providing important information, this approach has not fully captured all of the values individuals have for agricultural lands. A more nuanced accounting of the ways social interactions shape preferences could provide insights into conflict over appropriate land uses on agricultural lands.

Moreover, many efforts to protect farmlands have been successful. Efforts to protect agricultural lands began almost 40 years ago, and nationwide voters overwhelmingly approve referenda to support protection efforts. This suggests that we no longer need to emphasize what motivates individuals to support protection efforts. Rather research need to shift their gaze to understand what comes next; i.e. we've protected the farmlands, now what? More *back end* knowledge is needed to ensure that what we have protected will continue to deliver the valued goods motivating our efforts to protect the lands in the first place. At the same we are also at a

time when demographic changes in the rural countryside have amplified the likelihood for conflict about agricultural lands. Increased migration of non-farm individuals to exurban areas in search of aesthetic and recreational amenities raise the potential for conflict about land uses on agricultural lands. Therefore, research needs to address these areas. First, we need to develop more *back end* knowledge about protected agricultural lands. And second, we need to use a broader toolset to address these gaps in knowledge. This dissertation seeks to contribute to these gaps in knowledge using the mixed methodological approach outlined below.

MULTIDISCIPLINARY APPROACH TO UNDERSTANDING PREFERENCES

Critiques about the current state of farmland valuation research point to opportunities for improved ways of understanding preferences individuals have for agricultural lands. Notably, criticisms about the “commodity perspective” within the field of natural resource management drove new understandings of the ways people value natural resources that are especially applicable to the study of farmland protection (Williams et al. 1992, Williams and Stewart 1998). Chief among these new conceptualizations was a turn away from a singular focus on the biophysical and geographic values of settings or landscapes, and a turn to include the role of social, human, and meaning-oriented dimensions (Trentelman 2009, Williams et al. 1992, Williams and Stewart 1998, Williams and Vaske 2003). Similarly, they brought to the fore the social relational dimensions of natural resources utilization (Nygren 2000, Tuan 1977, Williams and Stewart 1998). In this dissertation, I approach questions about preferences for farmland protection with an intentional focus on the social, human, and meaning-oriented dimensions of values individuals have for agricultural lands. To do this, I rely on the theory of place attachment. Place attachment refers to the positive emotional bonds that develop between an individual and the environment (Raymond, Brown and Weber 2010). In this study, I draw from

this body of literature to identify ways that individual's preferences for protected agricultural lands have social and relational dimensions. I also use themes from political ecology to broaden the ways of understanding preferences for protected agricultural lands. More specifically, in Chapter 4 of this dissertation I use the themes of state capacity, property rights, and land tenure to help develop an understanding for concerns individuals have about the post-protection management aspects of protected agricultural lands.

Methodologically, it is also important to consider how different valuation techniques estimate different aspects of preferences for protected agricultural lands. Certain methodologies are more appropriate than others in identifying distinct values for protected farmlands (Freeman 2003, Johnston et al. 2001). Traditionally, two nonmarket valuation approaches have been used to determine the value of amenities associated with farmland: direct, stated preference techniques and indirect, revealed preference methods. Stated preference methods directly ask the public about their value for a good while revealed preference data use secondary data to infer values. In this dissertation I use both a stated preference method and a revealed preference method. I also address preferences for protected agricultural lands using qualitative interviews.

In order to develop a broader understanding of the types of preferences individuals might hold for protected agricultural lands, I use a qualitative study (Chapter 4). Qualitative interviews provide the space for respondents to define and explain, in their own terms, what aspects of protected agricultural lands they valued. Moreover, because respondents are able to describe themselves more completely, qualitative approaches also allow me to unpack some of the social processes influencing their preferences for protected lands.

I also use a direct, stated preference survey method to identify and measure the public's preferences for farmlands (Chapter 5). Stated preference survey methods are commonly used to assess the preferences individuals have for different farmland protection policies and is well-suited to measure both use and no-use values associated with changes in natural resources (Johnston et al. 2001). In these studies, it is common practice to have respondents make discrete choices between a set or sets of hypothetical policy alternatives, or bundles of commodities (Brown 2003). The survey used in this study differentiates from traditional farmland valuation studies in the following ways. First, part of the survey includes questions designed to measure respondent's level of social, cultural, and geographic ties to agriculture. This allows me to relate preferences for protected agricultural lands to a host of social, human, and relational dimensions. The second distinguishing characteristic of this survey is that it seeks to understand preferences for protected farmland by prompting participants to discuss their preferences in the context of farmlands that *have already been protected* within their community. This is distinct from the majority of farmland valuation studies in which study participants are asked to choose among different hypothetical farmland protection scenarios that vary in substantive ways (e.g. in the amount of land being protected). Inquiries about protected farmlands from this vantage point reduce information limitations that might introduce bias into studies (Cummings and Taylor 1999). A final way this survey is distinct is that I focus on questions that pertain to the *back end* aspects of farmland protection. Specifically, I measure preferences regarding the management plans of protected agricultural lands.

A third way I identify preferences for protected agricultural lands is through the use of an indirect, revealed preference method, the *hedonic pricing method* (Chapter 6). In this method, the value of nonmarket goods is not directly observed; rather, value estimates are inferred from

observed property transactions (i.e., the sales price of homes). The hedonic pricing method is premised on the assumption that the observable differences in property values reflect differences in the nonmarket attributes associated with the property and that these price differences are directly related to a consumer's WTP for these environmental attributes (Johnston et al. 2001, Rosen 1974, Taylor 2003). Thus, this method relies on the fact that the consumer can observe these different attributes. For this reason, the hedonic pricing method is best suited to identify the value of location dependent use values or use values that vary according to the location of one's home relative to the resource in question. Hedonic models are not able to identify use values that are independent of the location of one's home or non-use values (Johnston et al. 2001). In this study, I focus explicitly on the ways that proximity to agricultural lands influences premiums for homes.

CHAPTER IV

WEBS OF INTEREST AND RELATIONSHIPS MEDIATING PROPERTY RIGHTS

INTRODUCTION

In this chapter I present results from a qualitative inquiry that was designed to identify and describe the types of preferences stakeholders have for protected agricultural lands. The purpose of this study was twofold. First, this study was designed to allow stakeholders to define and explain, in their own terms, what aspects of protected farmlands they value in order to see if there are alternative understandings of preferences. Second, this study was designed as an initial step in the development of a survey instrument being prepared to identify management preferences for protected farmlands, the subject of Chapter 5 of this dissertation.

While the focus of the study was on stakeholders' post-protection preferences for agricultural lands more broadly, in this chapter I focus on a major theme that emerged from this study: stakeholder concerns about the capacity of the County to manage the protected agricultural lands in ways that meet individual preferences. More specifically, I focus on the ways in which relationships established between the County and farmers through lease arrangements on protected agricultural lands caused some stakeholders to question the capacity of the County to adequately meet their personal preferences for the protected agricultural lands.

In the sections below I begin by presenting the conceptual framework guiding the analysis of this qualitative inquiry. Because the findings discussed here were informed by literature from political ecology, I first present a focused review of political ecology literature, with an emphasis on key themes most relevant to this study. After this, I present the methods used to collect this data followed by a description of the relevant information about the study

community. Next I present results of the inquiry, followed by a discussion about the implications of these findings.

CONCEPTUAL FRAMEWORK

As a working landscape, agricultural lands are not homogenous or static. Rather they are cultivated landscapes subject to the agriculture-related land uses landowners employ to meet their needs. A piece of farmland in active use has the potential to generate both positive externalities (amenities) such as scenic landscapes and negative externalities (dis-amenities) such as odors or noise (Bergstrom and Ready 2009). Thus, land use practices employed on agricultural lands, post-protection, also largely determines whether the individual's demand will be met.

At the same time, land use practices employed on protected agricultural lands are, to varying extents, mediated by the legal encumbrance used to protect the land. Using farmland protection tools, such as conservation easements and fee-simple ownership, land trusts enter into what are often decade's long relationships with landowners that have direct bearing on the management realities of the protected lands. For instance, when lands are protected with a conservation easement, legal encumbrances are placed on the agricultural land with the general aim of preventing development. However, through this particular legal arrangement (conservation easement), the ultimate management responsibility for the protected lands is generally maintained by the landowner rather than the land trust or protecting agency; therefore a relationship is established between the land trust and the landowner in order to negotiate the future monitoring and enforcement of the laws and policies under which the land was protected.

In instances in which the land trust purchases the full ownership-rights in the land, the land trust assumes full legal responsibility for the management of the farmlands. However, it is

not uncommon for the land trust to then contract out the management of the lands because it is more cost effective (Allen and Lueck 2002). In the context of managing protected farmlands, land trusts and county employees generally lack the skill set and knowledge that full-time farmers have. At the same time, farmers are more likely to own the equipment necessary for farming; thus outsourcing management frees the land trust from capital expenditures for farming implements. Moreover, depending upon the nature of the lease agreement, leasing farmlands allows land trusts to shift the inherent risks associated with agriculture such as the seasonal forces nature imposes on agricultural systems or labor issues (Allen and Lueck 2002). As such, the relationships that land trusts establish through leases represent a crucial link in defining the outcomes associated with a protected parcel of agricultural land. Consequently, leases, and the relationships mediated through lease agreements, also directly establish the extent to which an individual's preference for protected agricultural lands will be met.

In this study, interviews with stakeholders revealed concerns about leasing relationships the County established to manage agricultural lands that had been protected through fee simple ownership. Moreover, some stakeholders expressed concerns that such relationships compromised the ability for protected agricultural lands to be managed in a way that met broader community goals and preferences. Chief among the concerns expressed by stakeholders were questions about the distribution of property rights associated with agricultural lands purchased with public funds and held in trust by the County. Related to this, stakeholders revealed concerns about the land tenure system established by the County to manage the protected agricultural lands, primarily those negotiated through leases. Combined, questions of property rights and land tenure resulted in some stakeholders questioning the capacity of the County to adequately manage the agricultural lands.

Political Ecology

These findings emerged after coding and analyzing nineteen semi-structured interviews. This process was informed by literature from political ecology. Political ecology is a framework employed to critically examine human-environment interactions in the environmental social sciences with an explicit emphasis on understanding the ways the concerns of ecology are inextricably bound to specific political economic contexts (Blaikie and Brookfield 1987, Forsyth 2003). At the center of political ecological accounts is the recognition that human-environment interactions are relational and the use of natural resources is organized and transmitted through social relations (Bryant and Bailey 1997, Paulson, Gezon and Watts 2003, Robbins 2012).

In this discussion, political ecology serves as a lens that draws explicit attention to the social relational aspects that constitute the post-protection management of agricultural lands. Because of its emphasis on the ways that social relationships shape and are shaped by human-environment interactions (Blaikie and Brookfield 1987, Bryant 1998), a political ecology framework provides a useful way to explore the concerns stakeholders expressed in this study regarding management practices for the protected farmlands. Importantly, the principal concerns that stakeholders identified during interviews coincided with key themes within political ecology including: land tenure systems, property rights, the role of the state in natural resource management, and the distribution of power.

Although political ecology frameworks have traditionally been used in Third World developing contexts, recent scholarship has illuminated ways in which many of the major concepts of political ecology can be successfully applied to analyses in First World settings (McCarthy 2002, McCarthy 2005, Schroeder, St. Martin and Albert 2006). Importantly, using the example of the Wise Use movement, McCarthy (2002) demonstrated the ways in which First and Third World rural resource conflicts have many overlaps, including issues about access to and

control over natural resources; ambiguities in property rights; the importance of informal claims to resource use and access; and the effects of limited state capacity (2002:1283).

Because political ecology is not a theory per se but a framework which pulls theory from multiple fields it was necessary to narrow the scope of this review. Thus, in this study I rely on the political ecology literature that addresses the social relational aspects of property rights and tenure (Bryant 1992, Fortmann 1996, Macpherson 1978, Meinzen-Dick and Mwangi 2009, Peluso 1993, Rangan 1997, Rangan and Lane 2001, Walker 2003), state capacity (McCarthy 2002, Peluso and Lund 2011, Peluso 1993, Rangan and Lane 2001), and power (Fortmann 1996, Macpherson 1978, Marchak 1988, McCarthy 2002, Rangan 1997, Walker 2003).

Property Rights & Land Tenure

Natural resource conflict is often related to complex tenurial systems (Bryant 1992, Fortmann 1996). Land tenure is the diversity of rules that define the relationships between individuals or groups and the land, including how access is granted for rights to use, control, and transfer land and the associated responsibilities and constraints (FAO 2002). In other words, land tenure refers to the social relations of property rights in land (Gilbert and Beckley 1993) and land tenure reflects societal values about the purpose of land and institutions of ownership (Bergmann and Bliss 2004, Fortmann 1996, Salamon 1993).

Several scholars have noted that in the United States it is common for us to think of property as binary, as something that is yours (fee-simple), or something that is not yours (Macpherson 1978, Meinzen-Dick and Mwangi 2009, Robbins 2012). Within political ecology, property rights are often thought of as more than just the mere possession of some good, but as bundles of socially enforceable, separable rights (Fortmann 1996, Macpherson 1978). As bundles

of rights, ownership can be subdivided into infinite number of rights associated with a resource or thing. Rangan (1997) distinguishes between mere *property*, which she defines as the exclusive right to ownership; *control*, the ability to mediate access to a thing or resource in varying degrees; and *access*, the ability to make use of a thing or resource (Rangan and Lane 2001). The ability to negotiate property ownership, control, and access are mediated through a diverse array of social relationships. Meinzen-Dick and Mwangi (2009) refer to property rights associated with land as a *web of interest* that are made up of a diversity of parties having rights to use, regulate, or manage the resource, which themselves are based on a range of customary institutions, local norms, and state laws.

Land protection relies on the “bundle-of-rights” concept of land ownership where certain rights (e.g. development rights) are separable from the land and can be held by multiple parties (Merenlender et al. 2004:67). The rights most commonly separated from land are the development rights (Merenlender et al. 2004). In farmland protection, the purchase of agricultural conservation easements (PACE) transfers ownership of the development rights associated with a parcel of land from a landowner to a land trust or legal entity, while the landowner maintains ownership of the physical piece of land (Parker 2004). This constitutes a shift in land tenure as a landowner’s *access* is mediated and controlled by the terms legally stipulated in the conservation easement.

State capacity

According to Weber (1919/1958) an essential element of a state is its capacity to professionalize and organize its legitimate use of force in a rational-legal structure of authority in a bureaucratic fashion. In the context of natural resources, a state’s capacity to manage and

control its natural resources is a function of the relationships between the state and civil society (Peluso 1993). Following McCarthy (2002) I use the term *state capacity* to refer to the ability of the state to run effective resource management bureaucracies, monitor resource use, enforce laws and policy, usually in the face of opposition by affected communities or individuals interested parties. Peluso argues that states “generally allocate rights to protect and/or extract resources in a way that benefits the state itself (in generating revenues that reproduce itself) as well as for the proverbial ‘greater good of society’” (1993: 200). In many instances this happens when states are simultaneously regulators and rent seekers; the state is responsible for allocating land and resource rights to those whom it is dependent upon for large parts of their operating budgets (Peluso and Lund 2011). Thus, instability or uncertainty in the control of revenue generating resources also often constitutes instability and uncertainty in the political economic realities and positions of the individuals holding positions of state power or benefiting from state power in some form (Peluso 1993).

Post-protection management of farmlands requires some level of state capacity. For instance, farmland protection requires the ability to run effective natural resource management bureaucracies in order to negotiate and protect the farmland initially. Once protected, the state or the land trust has to have the bureaucratic capacity to manage the necessary legal documents stipulating claims to the farmlands, monitor and enforce laws and policies upon which the protected lands are dependent upon, and to monitor the protected lands to ensure that its rights are protected. The extent to which this is done at all, and the degree to which this is done successfully in large part determines the level of success achieved when farmlands are protected.

Power

As a set of enforceable social relationships, property is an expression of power between people, since the claims determine who may benefit and who may be excluded (Marchak 1988, Rangan 1997). The individual or group who has the authority to mediate access (i.e., those with the ability to control) is in a position of power. Property rights are also historically contingent and politically partial (Fortmann 1996, Macpherson 1978). The laws governing the rights to property are expressions of social relationships, and overtime rules may be ignored, reinterpreted, or selectively enforced according to the purposes which society or the dominant classes expect the institution of property to serve (Macpherson 1978, Walker 2003). Likewise the meaning of property is not constant; the institution of property and the way individuals see and define it are fluid and negotiated and therefore subject to change over time (Macpherson 1978:1). Fortmann (1996) argues that part of understanding property as a social process is recognizing the importance of the power to define, attribute meaning, and assign meaning in struggles over the natural resources. Ultimately, the allocation of rights are legitimated and becomes useful to individuals and groups when it has consistent support from an authority (Meinzen-Dick and Mwangi 2009).

In farmland protection, power manifests itself in social relationships that define the terms under which the agricultural lands have been protected and the terms under which the lands will be managed, post-protection. For instance, when protecting agricultural lands with conservations easements, the bundle of rights that are distributed between a landowner and a land trust are subject to the individual or group that has the authority to control and define what the terms of the conservation easement will entail. While conservation easements do provide the legal space to include encumbrances that will foster specific types of management practices, the legal

negotiations are generally private conversations between the landowner, the land trust, and legal representation (Morris 2008). In many instances, conservation easements are also considered a private real estate transaction, further removing the possibility of public input or scrutiny and in so doing concentrating the decision making power regarding the legal elements stipulated in the contract to a select group of individuals (Morris 2008, Raymond and Fairfax 2002).

Furthermore, by their very nature, the impetus of farmland protection agencies is to protect agricultural lands. Consequently, they generally operate from a “willing buyer, willing seller” framework and thus seek to eliminate barriers for protection because restrictive easements, or those that require land to be managed in accordance with a specific production system, are often viewed as presenting serious obstacles to producers in need of flexibility to remain profitable (Dempsey 2012).

When agricultural lands are protected through fee simple ownership the management of the land generally becomes the purview of the land trust. In this case, the decisions made regarding the management of the protected lands are also subject to the individuals or groups that have the authority to control and define what the management terms will be. This includes the power to decide who has access and use of the natural resource. Moreover, as McCarthy (2002) notes, in the context of public lands the relationships mediating the complex relations of management are subject to a great deal of bureaucratic and administrative discretion that allows for leeway in how formal requirements are practiced. For instance, management plans are often subject to bureaucratic cultures, tacit endorsement of customary usage, routine violation of formal boundaries, and selective enforcement (McCarthy 2002).

Likewise, the tenurial relationships that are established in the process of outsourcing the management of publicly-owned lands are also expressions of power; the social relationships

embodied in the maintenance or transmission of land from one generation to the next are products of social processes (Salamon 1993). If these relationships are marked by social inequalities (e.g. by gender, family, or in a community) intergenerational land transfers are likely to perpetuate inequalities since the person controlling the transfer process is in a position to ensure the maintenance of the social relations (Salamon 1993, Salamon and Tornatore 1994).

METHODS

An explicit goal of this study was to identify whether individuals have preferences for post-protection management aspects of agricultural lands. Specifically, I was interested in allowing stakeholders to define and explain, in their own terms, what aspects of protected farmlands, they valued so that I could unpack some of the social processes influencing their preferences (Ritchie 2003:27). Therefore, a qualitative methodological approach was used. Below I describe the purposive sampling strategy used to select the community under study and the combined approach of purposive and snowball sampling to select participants for in-depth interviews.

Purposive Community Sampling

Sample participants were chosen using combined purposive and snowball sampling. In purposive sampling, the selection of participants is non-random and the sample units are chosen because they have specific characteristics or features which allow for the exploration and understanding of key research themes (Lewis 2003). Within this purposive sampling method, I was deliberate in my attempt to maximize heterogeneity among respondents in order to increase the diversity of information collected (Lewis 2003). Snowball or chain sampling approach is also a non-probability sampling strategy and is used to identify hard to identify or hidden populations

and involves asking people who are initially identified and interviewed to identify other individuals that fit the selection criteria (Lewis 2003, Singleton and Straits 2005).

Central characteristics used to identify participants included their level of interest or degree of connection to the protected farmlands of Boulder County. Interest and degree of connection to protected farmlands was characterized in the following ways. First, I attended an annual public land stakeholder meeting held by the County. In addition to meeting individuals at this meeting, I was given access to an email list maintained by the County that contained the names and organization affiliations of 41 individuals. In conjunction to identifying stakeholders from this list, I attended public hearings about the management of the protected farmlands (sugar beet debates, and the 60-acre farmland-use debate) and the monthly Food and Agriculture Policy Council meetings from 2008-2010 from which I derived the names and contact information of additional stakeholders. A third list of stakeholders was obtained from Boulder County Agriculture Department. The staff there supplied me with a list of individuals leasing protected farmland from the County. Finally, I used a snowball or chain sampling approach which involved asking people who I interviewed from my initial list of stakeholders to identify other individuals that fit the selection criteria (Lewis 2003, Singleton and Straits 2005). This method was used in part to ascertain whether I was reaching all of the protected farmland stakeholders and had heard from a representative from all of the possible viewpoints.

Sample Description

Nineteen stakeholder interviews were conducted during the spring, summer, and fall of 2012. I interviewed one individual from Boulder County's Land Use Department; two individuals from the County Parks and Open Space Department, both who direct job related ties to the county agricultural program; two individuals involved directly in the natural foods

industry in Boulder County, one of which had ties to the national organics market; one member of the bee community; one leader in the equestrian community; one leader of a local trails organization; two representatives of the local farmers' market; two individuals that represented anti-GMO groups; and four farmers, two conventional, large scale farmers, and 2 small-scale farmers. The majority of the participants, (13) had lived in Boulder County for more than 10 years and the average number of years of residence was 28.4 years. The interviewees were 50% male and 50% female.

TABLE 4.1 Description of Stakeholders Sampled

Stakeholder Characteristics		
Organization Affiliation	Description	Length of Residence in Boulder County
Natural Foods Community	Male, mid-50s	43 years
Natural Foods Community	Female, late 30s	19 years
Environmental Organization	Female, mid 60s	59 years
Bee community	Male, mid 60s	42 years
Farmers' Market	Female, early 40s	10 years
Farmer's Market	Female, early 40s	12 years
Horse Community	Female, late 50s	40 years
Anti-GMO Activist	Male, mid 50s	5 years
Anti-GMO Activist	Female, late 40s	23 years
Boulder County Land Use Department	Female, late 30s	3 years
Boulder County Parks and Open Space	Male, mid 60s	~60 years
Boulder County Parks and Open Space, Agriculture Department	Male, late 40s	22 years
Private, large-scale farmer	Male, mid 50s	55 years
Private, large-scale farmer 2	Male, mid 50s	25 years
Private, small-scale farmer	Male, mid 60s	26 years
Private, small-scale local food's farmer	Female, early 40s	10 years
Agricultural Open Space Lessee	Male, early 60s	?
Crop Consultant	Refused	
Agro-chemical Representative	Refused	
County Commissioners	Refused	

Contact Procedures

After compiling the list of stakeholders I made direct contact with individuals either by telephone, email, or some combination of telephone and email. The stakeholder list provided by

the County had email addresses of several of the stakeholders. For these individuals, I contacted them first by email using an email letter [See Appendix I for letter]. Included in my email was a short description of my study, my university affiliation, an invitation to participate in the study. Also included in the email was my phone number and it was typical for the stakeholder to call me to set up a time to meet rather than respond by email. I contacted at least six individuals by phone first because I did not have an email address for them. Also, generally, individuals identified through snowball sampling were contacted by phone because the participant recommending them for the study usually only had the individual's phone number. In instances of telephone recruitment, I followed a script in which I introduced myself, my university affiliation, the reason of my call, and then request made for their participation. In most instances the individual had questions about my study which I answered and the majority of individuals agreed to participate. In those instances, we set up a time and meeting place for the interview. In some instances we made an appointment for me to call them back to set an interview date at a later time. This was typical when I contacted the farmers, as many of them were 'in the field' when I called or it was a busy part of the season.

Response Rate

Of the individuals contacted by phone and email, 3 declined to participate. One individual was a representative of a large agro-chemical company, Monsanto. In a brief phone conversation she stated simply that [find notes about phone convo]. I also contacted a crop consultant that when asked if he would like to participate told me he would be available next year. Judging by the sarcastic tone in which he expressed this; I interpreted this as he was trying to get rid of me. Both of these individuals were suggested to me by interview participants as

individuals with important perspectives about farmland so it was unfortunate they were unwilling to participate. My third refuse to participate came from the county commissioner's office. Upon contacting their secretary a couple of times I was informed that they would not participate and that I should contact the County Parks and Open Space Staff. This too was unfortunate because their unique perspectives were also not captured.

Data Collection

Interview Procedures

Initially I developed four interview guides for each type of stakeholder interviewed: farmer; government official; open space council member; and the general public. Interview guides were field-tested. Ultimately I decided to use one guide after realizing the specialized collected nonessential data thereby increasing data collection time. One survey guide also ensured greater consistency across key areas of interviews. The interview guide is located in the Appendix II.

The interview guide was organized by themes. Questions designed to warm up participants were used at the start to make participants comfortable with the interview process (Lewis 2003). These questions asked participants' length of residence in Boulder County, what drew them to Boulder County, and what they love about living in Boulder County. The second section included questions about open space in Boulder County; specifically it elicited participant's level of knowledge about open space, their degree of interaction with open space, the role they thought open space played in the County. Participants were also asked to discuss what they thought were advantages and disadvantages of open space in the County.

In the third section participants were prompted to describe their feelings and opinions about the types of agricultural activities they felt should be allowed on the protected farmlands.

Participants were also asked about their ties to farming, both through their family heritage and through contemporary acquaintances and relationships. The fourth focused on local food production and asked participants to define *local food production*, their level of support for local food production, and any advantages and disadvantages of local food production. The fifth section re-visited the respondent's perspectives about agriculture on protected farmlands but with an explicit focus on the role of government in managing farmlands in general, as well as in Boulder County. The sixth section asked participant's to characterize their peer group's opinions about open space, local food production, and protected farmland management. The final section asked respondents about other stakeholder groups they felt should be part of the discussion about managing the protected farmlands in Boulder County. At this point in the interview, respondents generally provided names of individuals they thought I should contact.

The interviews lasted between 45 minutes and 2 hours. The interviews were digitally recorded and I maintained a record of notes taken during the interviews.

Field Notes and Challenges in Data Collection

The majority of the interviews took place at public locations such as coffee shops and government offices. I conducted one interview by phone due to scheduling conflicts. My experience with each stakeholder was pleasant and the majority of the participants were ready to tell me their "story" about agriculture and the protected farmlands in Boulder County. Initially, I was uneasy about contacting some of the conventional farmers in the County because I presumed they would be reluctant to share information because of my affiliation as a graduate student in an environmental studies program. However, once I made contact with these farmers, they generally did not convey any reticence. Part of this might have also been my personal identification as the

daughter of a conventional farmer. Early on in most interviews, a topic related to farming would generally present itself that provided an opportunity for me to identify my farming heritage.

In some instances, the participant directed the interview more than I realized during our conversation. As I compiled my notes it became apparent that there were questions that we did not address during the course of the interview. In these instances, I followed up the interview with a phone call mini-interview to fill in the blanks in key research questions.

Interviewing Over the Phone

As noted above, one interview was completed over the phone due to scheduling conflicts. In addition, 3 follow-up interviews took place over the phone I to address gaps in my data.

Data Analysis

Transcription

I transcribed all interviews verbatim from the digital recordings. In order to protect the anonymity of the participant during this process, identifying characteristics were removed from the transcripts and respondents were assigned pseudonyms. Interviews and field notes were transcribed as soon after the interview as possible.

Coding

Transcribed interviews were uploaded into NVivo10, a qualitative data analysis software program. Interviews were initially organized using a semi-focused coding approach (Auerbach and Silverstein 2003, Lofland and Lofland 1995) which involved reading through each of the transcripts with the following research questions in mind:

1. Does this relate to farmland preferences?
2. Does this help me understand the participant's farmland preferences better?
3. Does this have implications for farmland protection?
4. Does it simply seem important even if I cannot say why at this point

The purpose of this step was to select the relevant text and passages from the transcript that express a distinct idea about farmland preferences (Auerbach and Silverstein 2003) and was repeated for each of the respondent's transcripts.

As I moved through each participant's transcript, repeated ideas were organized in thematic categories. For example, in some interviews stakeholders spoke about their desire for greater access to protected farmlands. I pulled out these statements and placed them in a category labeled "access". Having gone through each transcribed interview once and collected these repeating ideas into themes, I paused to consider in what ways the categories of repeating themes were related. As I did this I also asked myself again my guiding research questions: How does this relate to farmland preferences; and how does this help me understand the participant's farmland preferences better?

After reviewing the data and sorting into categories a primary theme emerged: a concern about the capacity of the County to manage the farmlands it had protected. Subthemes within this major theme included concerns about property rights, land tenure, and the distribution of power in the decision making process regarding the management of the protected agricultural lands.

Additional Comments on Data Analysis

As I began this study I expected that interviews with various stakeholders would help me develop a clear list of specific land uses they deemed appropriate for the protected agricultural lands in the County. Moreover, after interviewing I imagined I would quickly incorporate these items into my survey. While the interviews did allow me to contextualize understandings and themes that I included in my survey, I did not expect the interviews to reveal the types of concerns about the capacity of the County to manage the lands it had protected. As I continued to

code my data, I consulted with the literature and had conversations with colleagues about how to best present this data.

RESULTS

In this section I present results from 19 semi-structured interviews with stakeholders. During the interviews, participants were asked structured questions to gain an understanding of their preferences for farmlands. Specifically, the interview guide prompted stakeholders to reflect on why farmland is protected; the role of protected farmland in the County; the type of farming that should take place on protected farmland; and advantages and disadvantages associated with certain farming practices on protected farmlands.

The major theme that emerged from this study was stakeholder concern about relationships the County established with farmers through agricultural leases. In particular, stakeholders expressed concern that the agricultural leases and the social relations that established the rights accompanying the leases compromised the County's capacity to manage the agricultural lands in a way that met broader community goals and preferences. In the sections below I outline particular aspects of these relationships using direct quotes from stakeholders to illustrate the nature of the concern. In certain parts I include relevant factual data gathered during the course of this dissertation to provide more detail to the specific concerns being illustrated. Ultimately the emphasis is on illuminating how concerns raised by stakeholders provide a starting point for thinking more broadly about preferences individual's hold for protected agricultural lands.

Partners in Conservation

When stakeholders expressed concern about the capacity of the County to manage the protected agricultural lands, they often aimed their critiques at the lease arrangements issued to local farmers by the County. As described in Chapter 3, the County administers leases on the 25,154 acres of publicly-owned agricultural lands and these lease relationships constitutes the backbone of the County's management plan for these lands. The County was managerially reliant on the farmers with whom they held leases because they lacked the staff capacity – in terms of both knowledge and human-power – to physically maintain the 25, 154 acres of agricultural lands. Some argued, this made the County beholden to the farmers. On the one hand, the County staff considered the farmers their “partners in conservation.” As one County official pragmatically stated:

Every one of those farmers is doing something that a staff member would have to do; and a staff member that doesn't have 5 generations of knowledge on how to do it. So maintaining that is, the biggest piece of that is managing those lands because we don't have a staff, well we have 80 tenants right now...So if you tried to take a look at what looks like for us as a department to try and manage those lands...

On the other hand, other stakeholders indicated that they were concerned about the outcomes tied to these relationships. Specifically, two stakeholders (one with ties to the Farmer's Market, another with ties to the Natural Foods Industry) alluded to the fact that the plan allowed the County to aggressively acquire lands without thinking beyond what comes after acquisition. Another stakeholder, Sheila (female, late 40s, ties to an anti-GMO group) stated that the plan disallowed the County to think about the entire 25,154 acres from a more “holistic” standpoint, which she defined as meeting the “highest and best use” of the lands from an ecological standpoint. Sheila went on to say “once it's passed into the public ownership, we as the County have a responsibility to manage it not only for the most productive use but what is going to benefit the public.”

More pointedly, some stakeholders expressed concern that the lease relationships tied the County to the farmers' agronomic practices, which were not in alignment with broader community goals. One stakeholder (male, early 60's) that was involved in the early planning stages of the County's Farmland Protection Program stated:

Their [County] decision was to do a lease program to the current farmers and not worry about what the agronomic policies were but to be more concerned about just going out and buying more land. You know, 'we have somebody taking care of that one, they have a lease on it and they're managing it for us, we can move on and think of something else.' And that was their way of doing it.

Similarly, another stakeholder (male, mid 60s, ties to the natural foods industry) stated:

The number one drawback to me is the agricultural practices on that open space. I don't think it is consistent with general majority's ideal for what for how agricultural practices should be done. We live in a community where environmentally sustainable and organic agricultural practices are embraced because people are concerned with the health of themselves, the health of the environment, the health of the land, the soil, the water and the air. And GMO agricultural production is counter to that in most people's opinion. Surveys have said.

As these stakeholders point out, the County's management plan made it not only reliant on a group of farmers, but it also made the County reliant on the agronomic practices which the farmers used in their practice. Of the 25,154 acres owned outright by the County, 1,418 acres are either certified organic agriculture (654 acres), transitioning to organic agriculture (725 acres) or used for small-scale market farms (39 acres) (Leffler 2012). Therefore, the majority of the farmers holding leases with the County currently practice conventional agriculture on the protected farmlands. It was the impression of these stakeholders, though, that this was not the type of agriculture the citizens of Boulder County preferred. However, the County is aware that large segments of the public have preferences for non-conventional forms of agriculture including organic, locally grown produce. For example, the County has sought to lower barriers in terms of transitioning from both large-scale agriculture (100 + acres) to small-scale agriculture

by investing in infrastructural upgrades. They also offer extended lease terms to farmers that are transitioning to organic production methods.

Rent Seeking and Regulatory Responsibilities

In addition to feeling like the County lacked the managerial capacity to take care of the lands themselves, stakeholders had concerns that the County lacked the capacity to have oversight of the farmers with whom they leased the lands because the County was in the dual role of being a rent seeker and a regulator. This relationship provides a financial incentive for the County to side with the farmer lease-holders when decisions are being made about farming practices in land management. John (male, mid 60's), a leader in the beekeeping community, expressed a common sentiment expressed during the interviews:

I think they want to do the right thing but I think they are concerned that if they don't allow the farmers to use commonly accepted practices they are going to lose the farmers and then who takes care of the land. But from the citizens' standpoint, there is great concern both by me and the broader community, that these assets that we have purchased, these open space agricultural assets are being improperly preserved.

As a rent seeker, Boulder County holds leases with 80 tenants on 120 parcels of farmland (Leffler 2012). In 2012 the County collected \$1,603,234 in gross income from rentals (Leffler 2012). The policy of the County is to reinvest the earnings from the leases back into capital improvements of the land and on average 50% of the revenues go toward inputs for the parcels (annual irrigation ditch fees and other inputs) and the remaining 50% is used to maintain the properties and make capital improvements (Stewart 2008). Thus, from a financial perspective, the County is reliant on lease-holders to not only manage the farmlands, but to also generate the revenue that underpins the management of the farmlands. Moreover, the County is especially

dependent upon 5 of the 80 farmers to whom it leases out the protected farmland. In 2012, 5 farmers generated \$1,064,098 in gross revenues or 66% of the gross income generated from the farmlands (Leffler 2012). Combined, this group of 5 farmers cultivated 5,147 acres or 21% of the County-owned farmland. Therefore, as a rent seeker, the County is responsible for allocating land to those whom it is dependent upon for large portions of their operating budgets.

Concurrently, the County's decision to outsource the management of the farmlands to lease-holders puts it in a regulatory position. As a regulator, the County is responsible for overseeing and monitoring the use and management of farmlands to ensure that lease-holders are compliant with the terms dictated by the lease, i.e. ostensibly terms set to maintain and/or achieve socially desirable conservation goals. However as John noted above, the County was bound to the farmers financially and managerially.

Lease-Backs and Tacit Endorsement of Customary Usage

Stakeholders were especially concerned about the *lease-back* relationships the County held with farmers who formerly owned the land. In these lease arrangements, the County purchased the agricultural lands from a farming family, and then leased the same land back to the former landowner-farmer. In effect, these relationships preserve the status quo which blurs the lines between private ownership and public ownership of the agricultural lands. Property lines were further obscured in instances where the landowner-farmer's family has owned and farmed the lands for several generations because for the most part, the social relations mediating access to the lands did not change.

In total, the County had 12 *lease-backs*. Josh (male, mid 50s), a stakeholder who had participated in public discussions and testified at public hearings about the management of the

County-owned farmlands, retold a story told he heard at a public hearing that illustrates the sentiment shared by other stakeholders:

One of the farmers told this story that their farm ...they sold it to the County and leased it back. And they are still farming their property the way that they were before. And there are a number of cases where the farmers sold their property and are continuing to farm it the way they were. They made a good bit of money and they are still continuing to farm it the way they were before.

Josh's concern was not unfounded. The *lease-backs* did open the door for tacit endorsement of customary land usage. For example, in a conversation with the County Chief of Staff about what types of farming should take place on the protected farmlands he stated:

I feel like farming in all of its incarnations should take place. For years the kind of farming that took place on all of our land was conventional. And the people that sold us their property for the most part were conventional farmers. And they didn't sell it to the County for the County to engage in some grand experiment. They sold it to the County with the idea that that agriculture would continue, the kind agriculture they had known."

While the county official acknowledged that all types of farming should take place on the protected farmlands, he was also dedicated to meeting a commitment made between the County and the landowner at the time of the property transfer. Tacit understandings that allow for customary farmland practices can morph into expectations and a sense of entitlement among farmers whose family's history are tied to the land. This in turn can reinforce a sense of ownership for lands that are now held in the public trust, further obscuring property rights, in addition to further wedding the County to specific agronomic practices.

Property Rights

More directly, tenurial relationships between the County and former landowners set into motion questions about the bundle of rights that accompany protected agricultural lands.

Specifically, stakeholders called into question the extent to which the public controls the right to make decisions about the practices that happen on the land when agricultural lands are protected with tax dollars. As Sarah (female, late 40s, member of the Food and Agriculture Policy Council) stated:

Right now these lands are managed by the tenants who have heritage with the land and their families have heritage with the land and they're treating it like its private property and it's not private property. And once it's passed into the public ownership we as the County have a responsibility to manage it not only for the most productive use but what is going to benefit the public.

Sarah's sentiment was shared by other stakeholders. Sue (female, early 40s, with ties to the County farmer's market) said:

You know, the public owns it, it's the tax dollars that have contributed to these open spaces and consequently I think that I think that they [the citizens of Boulder County] get a lot of say in it.

Many stakeholders questioned the distribution of rights between citizens and the lease-holders and felt that they had been excluded from the decision making process. Josh (male, mid 50s), a stakeholder who had participated in public discussions and testified at public hearings about the management of the County-owned farmlands, stated:

It has been all open space, the farmers of open space dictating how those things are used. And when we interjected ourselves into the discussion about thinking that allowing the planting of GMOs and chemical pesticides is not in the best use of the public's assets, it was like – don't tell us what we're doing, we're the farming experts here.

Concentration of Power

In a similar vein, some stakeholders questioned the concentration of power held by County agents to make decisions regarding the agricultural lands. Specifically, interviews

revealed two ways in which power was concentrated by the County through the farmland protection program. First, the County simultaneously accumulated and wielded power through its ability to purchase farmlands at market rate, in an already competitive land market. As Jacob, a conventional farmer that leases protected farmland from the County describes below:

If you really look when [the director] got that checkbook and started buying land, what [the director] did was really make it impossible for any farmer in Boulder County to competebecause [the director] was paying 10 times what it was worth. So you know, that is the reason I have real issues. [The director] was the biggest developer, buyer. [The director] has bought 125,000 acres. I don't know anybody that has amassed that much land. And basically all at development prices. And I'm not saying that is wrong. That is what the program was set up to do. But it has made it impossible for the agricultural community. You can't compete.

For Jacob, the County's acquisition of so much farmland in a competitive real estate market, requires purchasing power, i.e. wealth, to purchase and to out-compete other individuals interested in purchasing lands. Ironically, from Jacobs's perspective, the extent to which the County is able to do this potentially comes at the cost of out-competing the agricultural community whom it is purported to support through the protection program. At the same time, many of the concerns about the concentration of power expressed by stakeholders were typically in regards to the power held by one individual, the director of the Open Space Program. This sentiment is also reflected in Jacob's statement; the director of the Open Space Program was the locus of power, the one who "got the checkbook and started buying land" and made it "impossible for any farmer to compete."

A second area identified by stakeholders as examples of the County's concentrated power relates to the County's authority over issues of access to the protected agricultural lands. For instance, in a conversation about the disadvantages of protecting agricultural lands, June (female, mid 50s, active in the trail community), stated:

And so I've never understood why the County has been unable, unwilling to include language in its conservation easement for the consideration of a trail in some point in the future. At least not slamming the door. And the answer often is, well the farmer wouldn't want the public on its land. But the farmer has, let's say hypothetically the farmer has let the public be on its land the last hundred years. The real answer is, the real answer is XXX [the director of the program]. I hope you're not going to listen to this. The real answer is, first it's easier to control if the public isn't there. And, the second answer is that the County doesn't want the public there because we're not easy to control. So the County says to the farmer you don't want the public on your land. We're about to give you, Joe Famer, \$2 million dollars as a conservation easement for your 400 acre farm and you can keep farming, doing whatever you want within certain constraints, we have to agree on prairie dog management, we have to agree on weeds, we have to agree on the crops and now we're going to have to agree on the GMOs and organics and all that stuff but basically the farmer has been told that if he wants his \$2 million dollars he doesn't want the public on his land. And there are many farmers who had historic relationships with their neighbors who now have to say to their neighbor, I'm sorry but now I can't let you on my land because I didn't realize what I was signing away when I signed my conservation easement. Bad, sad situation.

June's experience with the County farmland protection program was that it exercised power through its ability to limit access to lands that were formerly open to many community members. And similar to Jacob's perception regarding the central holder of power, June's perception was that it was also the director of the program that held the ultimate authority to control the permissible land uses.

Some stakeholders also expressed concern that power was concentrated through the County's ability to limit access to the decisions regarding which lands the County would acquire, what the terms of the protection contract would be once it was decided to protect the lands, and who would lease the lands if the County purchased the fee-simple ownership in them. As illustrated in an earlier quotation, Josh felt that he had been purposefully excluded from the management decision making plan and that "it has been all open space, the farmers of open space dictating how those things are used." Larry (male, mid-60s), a private, small-scale farmer who had been "the most regular attendee" of the public meetings regarding the acquisition and

protection of County farmlands for the past 15 years alluded to the “closed door” nature of the process used to determine acquisitions:

Some of their purchases have been a bit questionable as far as ethics is concerned. Well, all of them are negotiated behind closed doors. In some cases I’m afraid they’ve been kind of played hard ball with some of the landowners. Although Larry did not elaborate about what he meant by playing hard ball, he did continue to state that he had supported every ballot initiative proposed to support the acquisition of open space and farmland in the County. Interestingly, in other instances when stakeholders revealed concerns about the concentration of the power within the County, they did so off record.

DISCUSSION

Post-protection management of farmlands requires some level of state capacity. For instance, farmland protection requires the ability to run effective natural resource management bureaucracies in order to negotiate and protect the farmland initially. Once protected, the state or the land trust has to have the bureaucratic capacity to manage the necessary legal documents stipulating claims to the farmlands, monitor and enforce laws and policies upon which the protected lands are dependent upon, and to monitor the protected lands to ensure that its rights are protected. The extent to which this is done at all, and the degree to which this is done successfully in large part determines the level of success achieved when farmlands are protected.

Tangled Webs

In this study, the primary way the County handled the post-protection management aspects of the public agricultural lands was through a lease program. Part of the County’s ability to acquire so much land was predicated on its decision to outsource the management of the County-owned farmlands. From an economic standpoint, outsourcing management of farmlands is a rational decision (Allen and Lueck 2002) and is a model followed by many land trusts nationwide (Parker 2004).

At the same time, outsourcing the management of the protected farmlands created a tangled web of interests which created uncertainty about property rights among the County, the farmers, and the non-farm public. A primary way the County contributed to this was by creating land tenure systems that were historically contingent on agreements made during the negotiation phase of protection. This is most extreme when the County commits to *lease-back* the land to the landowner-farmer from whom it is purchasing the farmland. These relationships, as described by the County agent, are negotiated during the process of protecting the farmland. This relationship sets the stage for confusion regarding property rights on multiple fronts.

For starters, in instances where the County negotiates a *lease-back* relationship with a landowner-farmer, the same family maintains possession of the land, despite a legal change in ownership. Therefore, although the County may maintain legal proprietorship, the landowner-farmer maintains control of the physical piece of land. Second, if the County has also stipulated that the landowner-farmer can continue to farm, like they always have, the County further cedes land management control to the landowner-farmer. In instances where the landowner-farmer's family has owned and farmed the lands for several generations, further ambiguity of the property rights is introduced because for the most part, the social relations mediating access have not changed; the status quo is being preserved. At the same time, granting private privileges can morph into expectations and a sense of entitlement among farmers whose families history are tied to the land. This in turn can reinforce a sense of ownership for lands that are now held in the public trust.

Property Rights and Distribution of Power

Foremost, stakeholders concerned with the County's capacity to manage the farmlands were concerned with the ways that the *lease-backs* cede power they had vested in the County

(through voting to approve sales tax referenda) to the private landowner. Although they did not use this language, the stakeholder's appeals to the "public good" and "community goals" were attempts to claim access to their rights to participate in the management decision making process. But, when the County uses public funds to protect farmlands, the type of property rights at stake are not well defined. For instance, as revealed in this case study, some stakeholders understood that their support for farmland protection (via sales tax referenda) gave them a right to participate in deciding how the County-owned farmlands would be managed. However, because the County often ceded this authority to the landowner-farmer during the protection process, the implicit understanding is that the public does not have this right.

Moreover, it was the experience of some stakeholders that when they tried to participate in the discussions, they were excluded. While the extent to which this claim is empirically accurate is uncertain it is worth noting that the County did eventually go through 2-year study period and public process to gather input from individuals about how the farmlands should be managed prior to my interview with this stakeholder. More importantly though, the point of noting this stakeholder's distress about being excluded from the process is to illustrate the extent to which some stakeholders perceived their right to participate as being violated. This further suggests that stakeholders, while concerned about specific land uses, were ultimately most concerned with their rights to be a legitimate part of the discussion.

Whose Bundle of Rights?

It was unclear, in this case study, whether the County initially³ recognized whether the right for the public to participate in the land use decision process was a right that was bundled

³ I use the term initially because the County did eventually have hearings regarding the management practices of the farmlands. However, the hearings and the public process the County went through were years after some of the

among the other rights being secured when farmland was protected. Interestingly, even though in the U.S., property rights are generally thought of in a binary fashion, (i.e. either you own it or you don't) (Macpherson 1978, Robbins 2012) farmland protection in the is predicated on the recognition that farmland is more than just a physical parcel of land. Land protection relies on the “bundle-of-rights” concept of land ownership where rights are separable from the land and can be held by multiple parties (Merenlender et al. 2004:67). Therefore, it is curious that the County did not initially recognize this as a right or if they did, ignored it for some reason. One possibility is that, despite recognizing that farmlands do consist of multiple rights, the County still thought of these rights in more traditional terms. For instance, perhaps they conceived as property rights in a biophysical context and thus recognized that one could own the physical piece of land and the development rights (which are commonly secured in conservation easements) but the right to participate in the decision making process did not fit within a biophysical framework. As noted in Chapter 2, this sort of conceptualization is consistent with the focus of the majority of farmland valuation research, which privileges biophysical aspects of natural resources over more relational

Morris (2008) argues that while the cost of land protection has remained public, the governance of such efforts has been privatized. Therefore, the County's failure to more formally recognize the public's right to participate in the management process also reflects norms within land protection. This reasoning also helps to explain why the lands that the County has protected using conservation easements were never on the table for discussion. Curiously, even though the County ultimately held several debates about the management practices on the farmlands, the

initial *lease-back* agreements were negotiated. Moreover, a full accounting of the public process that eventually occurred is beyond the scope of this dissertation, rather the focus of this study is on identifying what types of management preferences the public has for protected farmlands.

only lands that were discussed were those farmlands that the County had purchased fee-simple ownership in. This is further reflected in the lack of official acknowledgement of the 19,164 acres of farmland protected via conservation easement in the County's Farmland Management Plan. As the plan is written, the lands protected via the County's conservation easement plan do not fall under the terms outlined in the County's Cropland Policy (CPAG 2011). In the minority report, however, it was recommended that the lands protected through conservation easements be held to the same standards (CPAG 2011:98).

On the other hand, it is possible that the County did recognize the complexity around the property rights associated with protected farmlands, but were reluctant to acknowledge the extent that the public should participate because they benefited from the status quo; the County was financially and managerial reliant on the system they had set up with the farmers. Changes to that system might therefore redistribute the benefits being derived from the farmland protection program. Moreover, acknowledging the public's right to participate also shifts the balance of power. More specifically, the County's acknowledgment that the public does have a right to participate in the decisions about the management of the farmlands, would require them ceding part of the power they possess as well as the power they ceded to the landowner-farmers.

Institutional Power

Ultimately, concerns expressed by stakeholders in this case study reveal deeper concerns about the manifestation of institutional power held by the County. Specifically, routinized practices employed by County staff to secure the protection and the current and future management of the agricultural lands excluded the general public from the decision making process, thereby controlling access of a publicly-held natural resource. Importantly, many

stakeholders explicitly stated concern that the decision making power regarding the management of the protected agricultural lands was concentrated largely in a few hands within the County Open Space Program. In conversations with the County staff regarding the protocols in place for decisions regarding protected agricultural lands, I was informed of the Colorado Open Meetings Law which stipulates that all local public bodies with three or more members attending a meeting in which public business is discussed must give public notice at least 24 hours in advance and post details of the agenda. Moreover, I was informed that decisions regarding the acquisition of lands are issues voted on during public meetings by the Boulder County Parks and Open Space Advisory Committee. However, as noted earlier, others have found that the negotiations leading up to the protection of lands are not public meetings, but rather, are considered private transactions and thus, not subject to public scrutiny (Morris 2008). Therefore, while the final approvals regarding part of the process of farmland protection are voted on during a public meeting, it is reasonable to assume that in Boulder County, some of details are also negotiated “behind closed doors,” thus limiting the access of individuals that can participate in the decisions that will influence the outcomes associated with the lands. At the same time, interviews also revealed some of the tacit agreements that were made between the County and the landowner and/or lease-holder that might not have been possible had the transaction taken place in a public arena. Collectively, these less visible aspects of farmland protection, where the County is able to exclude the general public from a decision regarding the protection or management of protected agricultural lands, represent expressions of power that have become institutionalized, in part through the social relationships embedded in the process of protecting, and maintaining the protected agricultural lands.

FINDINGS AND IMPLICATIONS

This study provides insights that are important for both practice and research. In this section I first address the implications of these study findings for management. Then I address these findings as they relate to research of protected agricultural lands, and more specifically to questions I ask in my quantitative survey.

Management Implications

This case study provides a cautionary story for managers involved in the practice of farmland protection. Most likely, land trusts that purchase the fee-simple ownership in lands are always going to outsource management responsibilities to a second party. However, as this study illuminates, land trusts that develop management models based on leases need to be fully cognizant of the implications of such plans. In this study, by tying themselves economically and managerially to a group of farmers, the County tied itself to the agronomic practices of the farmers, which some community members were uncomfortable with. Depending upon the broader goals of the land trust, and of the community supporting the protection efforts, similar plans may also result in conflict.

Moreover, this study suggests that organizations that protect lands through fee-simple ownership need to be very aware of the resources required to manage the lands, in the event outsourcing is not an option. More generally, do land trusts that have purchased large quantities of agricultural lands have a long-term management plan in mind? How would they manage the lands if they were unable to find someone to lease the lands? How economically tied is their program to the production output on those lands? More broadly, how are budgets designed to promote the acquisition of lands over the management and regulatory budgets? Is this a local

trend or is also something that occurs, or is structurally supported, through the national Farmland and Ranch Protection Program?

Lease relationships between former landowner-farmers should also be negotiated with care. Lease-back relationships that maintain the status quo on lands that are no longer completely privately owned contribute to confusion and conflict regarding property rights, for the landowner and for the general public. Importantly, in this study it created a sense of exclusion and stakeholders felt that their views were not being represented. Previous studies about natural resource have found that when people feel their views are not included, they view the entire process as unfair and lacking legitimacy (Yung, Patterson and Freimund 2010). Thus, management agencies would be well served to pro-actively identify ways to establish an open and clear policy regarding the management practices and the decision making processes accompanying their programs.

At the same time, this study suggests that agencies protecting farmlands would be well served to clearly define the goals of their program. In this study, the County agency understood that they were protecting farmlands. More specifically, the County understood this to mean they were helping farming families maintain their family farms in a community where agricultural lands were quickly being developed into residential neighborhoods. Through their protection program, the County was able to purchase the land and then lease out, what would have otherwise been unaffordable land, to families. In contrast, the concerns stipulated by some stakeholders suggest that while they may agree with this aspect of protecting farmland, they would also put further restrictions on the lands that have been purchased. In particular, they would limit the types of farmland practices to those practices that were more “environmental”.

Research Implications

This study provides another example of how key themes of political ecology are directly relevant to natural resource issues in the First World. Specifically, the key themes of political ecology, including ambiguous property rights; implications of limited state capacity; disputes over access and control of resources; and the manifestation of power through social relations mediating natural resource use provide insight into reasons why conflict regarding protected agricultural lands may occur. Perhaps more importantly, by illuminating the social relationships embedded within the protection and maintenance of protected agricultural lands, a political ecology approach, based on in-depth field interviews, also provides a more nuanced understanding of the dynamics which influence the outcomes we can expect from protected agricultural lands.

This research also illuminates areas that are understudied. First, study made clear that some stakeholders had concerns about the management practices employed on farmlands, post-protection. As noted in earlier chapters, *back end* issues of farmland protection are understudied; however, because farmlands are constantly changing landscapes, they require management. Thus, this suggests a host of new questions for farmland research. A beginning question is: How representative is this finding? Do a majority of citizens hold specific ideas about how farmlands should be managed? Is this sentiment limited to those individuals that actively support farmland protection (e.g. through voting, donation to a private land trust)? Are there certain demographic or social factors that distinguish individuals that have specific ideas about how farmlands should be protected? What role does geography play, are those individuals that live adjacent to protected agricultural lands most likely to be the most concerned? Are individuals protected agricultural

lands in the West more likely to Are management preferences for protected agricultural lands contingent on an

More broadly, this study suggests that when some individuals support farmland protection, they conceive of it as securing their right to participate in the decision making process tied to the lands that they are helping support. Again, this insight suggests questions for research. For instance: How prevalent is this sentiment? How does this sentiment vary as the protection tool changes (i.e. are stakeholders more likely to hold sentiment if the lands have been protected through fee-simple ownership?)? What social or geographic factors influence this sentiment?

At the same time, this study hints that segments of the public might value farmland protection as a tool to shape what they consider to be appropriate forms of agriculture. This begs larger questions of the institution of farmland protection. Primarily, what goals are we trying to achieve from farmland protection? As described in Chapter 2, the history of farmland protection in the United States was fraught with conflict. From the outset, agricultural interests group were against early efforts to establish a national farmland protection program and argued that it was an urban-centric notion that served as a “smoke-screen for property owners who want a bucolic view” (Simon 1994, from Bunce 1998: 240). Furthermore, the notion that farmland protection is a tool used by urban interests to achieve their goals opens the door for questions regarding the shifting nature of power within agriculture. Traditionally, agriculturalists have largely been considered the chief managers of farmland. However, an increasingly varied range of individuals and groups are having a say in what constitutes appropriate agriculture (Lenihan, Brasier and Stedman 2009). Is this an instance of the non-farm public claiming a say in what types of agriculture can occur? If so, what are the implications of this? How should farmland protections agencies respond?

LIMITATIONS

Because this was a case study, the findings were drawn from a purposive sample of stakeholders who by their very nature of being a stakeholder have significant interest in the protected farmlands. Therefore, while their concerns help identify aspects of farmland protection that are problematic, I am unable to generalize these findings to a broader audience. Moreover, this case study was situated in Boulder County, Colorado, a place notorious for being different than the norm. It has been classified as one of the most liberal counties in Colorado, having significantly higher levels of median income, higher average levels of education, and higher levels of political efficacy. Despite these limitations, Boulder County is well-known for their progressive land use planning (Miller and Wright 1991). Thus, while this study may present sentiments that are reflective of a “fringe” population, they do serve as a model for other land trusts and government agencies involved with regional planning nationwide. Therefore, these lessons do have applications beyond the narrow scope of Boulder County, Colorado. At a minimum, these findings suggest that in this case, a segment of the voting public was unhappy about the process the County used to manage the farmlands, and their support for protection efforts may well be contingent upon the extent to which they feel they are included in the decision-making process in the future.

CONCLUSION

A primary goal of this inquiry was to allow stakeholders to define, in their own terms, their preferences for protected farmlands in order to develop a broader understanding of what it is that individuals value and desire from protected agricultural lands. In particular, this study brought to light the ways in which institutional practices, including the leasing of agricultural lands, mediated the social relational aspects of farmland protection. In particular, property rights

and land tenure relationships were negotiated and maintained through lease agreements, which often originated during the land protection process. Because agricultural lands and the products derived from them will vary according to management principles, the lease arrangements mediated the outcomes that can be expected from the protected agricultural lands which in turn largely determined the extent to which citizen's preferences for protected agricultural lands could be met. Thus lease relationships effectively vested power in the landowner-farmer by giving them the rights to manage the lands.

At the same time, this study was an initial step in the design of a general population survey, the subject of Chapter 5. Briefly, two key concerns emerged in this study are further addressed in the survey. First, this study pointed to ways in which segments of general population had specific ideas in mind regarding the primary goal of protection efforts. This concern is addressed in the survey through questions that ask respondents to identify whether or not limiting the types of agricultural practices is chief among their goals when they support efforts to protect agricultural lands. Second, stakeholders in this study were concerned that they were not a part of the post-protection management decision making process. Thus, I address this in the survey as well.

CHAPTER V

A SURVEY OF PREFERENCES

In this chapter I present results from a survey that was designed to contribute to two gaps in the traditional farmland valuation literature. First, this study was designed to identify preferences related to the *back side* of farmland protection. Specifically, in this study I sought to identify preferences community members held for management aspects of protected agricultural lands. Second, this study was designed to consider how preferences for agricultural lands are related to a set of social, cultural, and geographic factors.

In the following sections I present the conceptual framework that guided the design of this study and analysis. Following this is a focused review of relevant research that also informed this study. Next I present the methods used to design and collect the data, followed by a description of study respondents. Finally, I present the analytical framework and the findings of this quantitative study. The chapter concludes with a discussion about the findings, the limitations, and broader implications of the study.

INTRODUCTION

As noted in earlier chapters, a majority of farmland valuation studies have commonly been studied from a utilitarian framework. Thus, agricultural lands have generally been treated as collections of attributes (e.g. non-market goods such as ecosystem services) that first need to be identified, and second, need to be valued economically so that the demand can be met efficiently. This “commodity perspective” (Trentelman 2009, Williams and Stewart 1998) has largely placed an emphasis on the tangible, biophysical aspects associated with agricultural lands. Moreover, in

instances when social factors have been considered, they have generally been accounted for in a traditional sense; i.e., by considering the ways that education, age, and income influence an individual's willingness to pay for farmland protection (Beasley, Workman and Williams 1986, Bergstrom and Ready 2009, Irwin, Nickerson and Libby 2003). These studies rarely measure the ways other social and cultural characteristics might influence preferences for protected agricultural lands, even though preferences likely transcend traditional socio-economic categories (Kline and Wichelns 1998). As such, the commodity approach has generally not accounted for the ways in which individual preferences for agricultural lands are shaped in a social context made up of interactions with people, with places, and with people and places.

Because such accounts do not consider the interactive aspects of human-environment relationships, or the ways in which social meanings are constructed in specific contexts (Stedman 2003, Vorkinn and Riese 2001), they do not fully capture all the ways that individuals develop value for protected agricultural lands. In terms of understanding conflict about protected agricultural lands, a fuller accounting is warranted. Specifically, the notion of place attachment provides a complementary way to understand preferences for protected agricultural land. The concept of place attachment has been studied among a diverse group of inter- and multi-disciplinary scholars and is therefore defined in a variety of ways (Trentelman 2009). Following Brown and Raymond (2007), in this study I define place attachment as a concept that refers to the positive emotional bonds that develop between an individual and their environment. Place attachment has been found to influence people's attitudes toward land preservation (Lokocz, Ryan and Sadler 2011). Brandenburg and Carroll (1995) argue that understandings about the ways that individuals develop meanings and thus value for places through emotional connections offers a way to discover common ground around contested land use issues.

LITERATURE REVIEW

Place attachment research has established that individuals develop emotional bonds with their natural resource environment through multiple dimensions including place identity, family bonding, social bonding, nature bonding, and place dependence (Raymond, Brown and Weber 2010). Place identity is a concept used to refer to the ways in which landscape and place provide a sense of history, distinctiveness, group membership, self-esteem, and self-efficacy which contribute to one's identity (Wester-Herber 2004). Bonaiuto and colleagues (2002) found that communities with higher levels of social and place identity were more supportive of sustainable attitudes than those with weaker place identities. Wester-Herber (2004) contends that because place identity is central to an individual's sense of self any land use change has the potential to stimulate unpredicted and unwanted changes in self-identity.

Family ties, have been found to reinforce one's emotional bonds to place (Raymond, Brown and Weber 2010). Likewise, social bonding, the way feelings of belongingness to groups of people based on shared history, interests, or concerns, has also been found to reinforces positive emotional ties to a particular place (Trentelman 2009). In the context of agricultural lands other studies have found that being socialized in a farm environment, either through living in a rural place, growing up on a farm, or having social ties to farmers are related to the endorsement of an agrarian belief system (i.e. the belief that farming and farmers are an essential aspect of the nation's well-being) (Dalecki and Coughenour 1992).

Studies have also found that family and social bonding often act in concert with natural environmental dimensions to influence place attachment (Brehm, Eisenhauer and Krannich 2004). Specifically, nature bonding, a dimension that refers to an individual's emotional connections to nature, has proven to influence an individual's overall attachment to a place (Brehm, Eisenhauer and Krannich 2006, Raymond, Brown and Weber 2010). For instance,

studies have found that an individual's emotional affinity is a predictor of pro-nature protective behavior and place attachment has been proven to influence the perception of and response to actual changes in the environment, and attitudes toward specific land use changes (Vorkinn and Riese 2001). Importantly, in some instances, nature bonding has been shown to be a more relevant predictor of environmental concern than length of residence when issues of resource protection are at hand (Brehm, Eisenhauer and Krannich 2004, Brehm, Eisenhauer and Krannich 2006).

Place dependence, defined as a functional connection to place based on the capacity for the place to support specific uses (Raymond, Brown and Weber 2010, Williams et al. 1992, Williams and Vaske 2003) also influences place attachment. Sharp and Adua (2009) found support for farmland preservation among individuals that engaged in more frequent participation in rural recreational activities such as visiting small towns for recreational shopping or sightseeing, recreational drives through the countryside, travel to a rural area to visit friends, family, or to experience/view a natural area, hiking, biking, canoeing, or visiting a farm.

In the context of protected agricultural lands, these aspects of place attachment suggest that individuals with familial ties to agricultural lands might have distinct preferences for protected agricultural lands compared to those that do not have the same familial ties. Also, individuals that have more interactions with rural lands are also likely to support efforts to protect agricultural lands and those individuals that have developed emotional ties to agricultural places through nature bonding are more likely to have environmental concerns.

The purpose of this study is to identify the public's management preferences for protected farmlands and to relate these preferences to a set of social, cultural, and geographic factors in order to identify the extent to which these factors influence preferences. Specifically,

in this study I examine the degree to which an individual's management preferences for farmlands vary as their social proximity to farming changes; as their geographic distance to the nearest farmland varies; and their level of interactions with farmlands changes.

METHODS

In the sections below I describe the process used to design the survey and to identify and recruit an appropriate portion of the general public to participate in the study. Next, I discuss some of the challenges that arose during the course of the study and the implications. Following from there, I provide a description of the survey respondents. This is followed by a description of the data analysis approach used, and the results. The chapter concludes with a discussion, including a description of the study's limitations.

To obtain information about the public's preferences for different management practices associated with protected farmlands, I designed an online survey. Specifically the survey had the following aims:

- (1) Identify the frequency and strength of different management preferences (desired land uses and level of involvement in management decision making) for protected farmlands.
- (2) Relate management preferences to an individual's level of place attachment, cultural and social ties to agriculture, level of regular interaction with agriculture, geographic proximity to protected farmlands, level of support for protection efforts, and demographic characteristics.

SURVEY DESIGN

Design of the survey occurred in four phases. In the first phase I attended several County organized meetings about the management practices on the protected farmlands. Beginning in

the summer of 2008 through the winter of 2011 I attended monthly meetings of the Boulder County Food and Agricultural Policy Council (BCFAPC). The BCFAPC was created in the summer of 2008 and consists of ten voting members appointed by the Boulder County Board of Commissioners. The meetings were generally held at the Boulder County Parks and Open Space (BCPOS) Department's headquarters, were organized by a BCPOS staff person, and lead by an elected chairperson. The mission of the BCFAPC is "to promote a locally-based food and agricultural system that advances Boulder County's economic, environmental and social well-being, through research, education and public policy recommendations (BCFAPC 2009). During this time I also attended three Board of Commissioner hearings, a joint study session of the BCFAPC and the Parks and Open Space Advisory Council, a County organized farm tour, a county organized Open Space open house, and a biannual "Stakeholders of Open Space" meeting. These meetings allowed me to get a sense of the issues related to the protected agricultural lands in the County and of the issues at hand.

In the second phase I interviewed 19 community residents that had ties with the protected farmlands in the County to gain an understanding of their post-protection management preferences for farmlands. (The method for identifying these community members is described fully in Chapter 4). Specifically, the interview guide prompted the respondents to reflect on why farmland is protected; the role of protected farmland in the County; the type of farming that should take place on protected farmland; and advantages and disadvantages associated with certain farming practices on protected farmlands. A primary theme that emerged from this inquiry related to concerns about who should be able to participate in crafting management plans for protected farmlands. Notably, while stakeholders held definite ideas about certain farmland

practices that should be allowed, they overwhelmingly couched these concerns in a broader concern about the management plan.

The third phase of the survey included the actual development of the survey instrument. In addition to relying on the data gathered during the stakeholder interviews described above to develop survey questions, I also referred to previous studies about protected agricultural lands and place attachment. Specifically, I adapted a series of questions to measure place attachment from a study by Raymond, Brown, and Weber (2010). I also relied on a study about attitudes about the nonmarket agricultural amenities by Mathews (2011) and a study about the social basis of agricultural-environmental concern by Sharp and Adua (2009).

In the fourth phase I pre-tested the survey in two different ways. Initially I used a convenience sample of colleagues and faculty. In this pre-test, I emailed 15 individuals a link to the survey and a password. They were asked to take the survey and answer a series of questions embedded within the email soliciting their help. Notably, several of the individuals in this sample had very little knowledge of protected farmlands. Thus this process provided insights regarding the way some questions were framed at a level of detail not appropriate for the general public. Furthermore, an initial version of the survey indicated that individuals sometimes consider open space and farmland as one in the same thing. Thus, the final version of the survey included a section clearly detailing how the term *farmland* would be used in the study.

A second, more formalized, pre-test was also administered. This pre-test began with a letter of invitation created to recruit participants into the study. Importantly, this pre-test provided a means of testing the usability of the web address of the survey. I also included comment boxes after each question, allowing participants to provide specific concerns and general comments. Importantly, one respondent indicated that he was reluctant to finish the study

because I had required responses to income levels. In other words, I had structured the survey so that you were not allowed to proceed unless you answered the question indicating your income level. This pre-test was administered to 50 individuals that represented a subset of the randomly stratified sample used for the survey. The comments provided by respondents allowed me to identify questions that need clarification. A copy of the final survey is included in Appendix IX.

Sample Selection

The sampling strategy for this study was guided by the goal and primary aims of the study. First, since the overarching goal of this study was to identify the *public's* preferences for the post-protection management of farmlands, the study requires a sampling strategy that elicits responses from individuals that are as representative of the public as possible. Second, one aim of this study was to identify the perceived impact farmlands have on property values. Thus, it was important to limit the population to those individuals that own their properties. Therefore the sample was targeted to individuals who owned their home and that were more than 18 years of age. Another aim of the study was to relate the perceived impact that farmlands have on property values to findings from the Hedonic Model presented in Chapter 6. Thus the sampling frame consisted of those residential addresses that were utilized in the Hedonic Model and the units sampled were households. More specifically, the sampling frame consisted of Boulder County, Colorado residential properties that had been sold between the years of 2001 and 2010.

Another aim of this study was to identify whether management preferences for the protected farmlands varied spatially. For example, I was interested in identifying whether preferences for specific land uses varied by distance an individual's property was to the nearest agricultural land. Boulder County has also protected approximately 73,000 acres of open space lands in addition to the agricultural lands. Therefore, to control for these protected lands, the sample was stratified

based on the geographic distance to agricultural land and open space land (henceforth called openland). In general, stratified samples are used if there is a potential for the variable of interest to take on different mean values in different subpopulations (Lohr 1999). Stratification also reduces the standard error of the estimates (Heeringa, West and Berglund 2010). I divided the sampling frame into 6 strata. The strata do not overlap; each stratum contains the entire population and each household address only belongs to one stratum. The first stratum contained household addresses that were directly adjacent to open land or farmland. Following Metz (2010), the minimal width of an urban road is 32 feet, therefore a household is considered directly adjacent if it is no more than 30 feet away from the farm or open land parcel. The second stratum contained addresses that were greater than 30 feet away but less than a ¼ mile away from the nearest farmland or open land. Subsequent strata were parsed at ¼ mile increments.

Of special interest was identifying whether those households located directly adjacent to farmland or open land varied in statistically significant ways from households that were not directly adjacent. Thus, once the sampling frame was stratified, I drew an independent probability sample from each stratum. However, I purposively over-sampled those households that were no more than 30 feet away from farmland or open land [See Table 5.1].

TABLE 5. 1 SURVEY POPULATION			
Strata	Distance from nearest agricultural land	Number of households (%)	Sample
0	0 – 30 feet	1,158 (4.8)	750
1	> 30 feet and < ¼ mile	8,277 (34.6)	150
2	¼ mile – ½ mile	5,739 (24.0)	150
3	¼ mile – ½ mile	4,975 (20.8)	150
4	½ mile – ¾ mile	2,685 (11.2)	150
5	> ¾ mile	1,067 (4.46)	150
TOTAL		23,901 (100)	1500

Data Sources

I used spatially referenced real estate data acquired from the Boulder County's Assessor's Office. After requesting data sharing with the County they provided me with a spatial dataset that included all sales between the years 2000 and 2010.

Sample Description

The houses in the sample had a mean sales price of \$414,595 in 2010 dollars. The average home size was 1,864 square feet, had 2.74 bathrooms, and was about 31 years old. Seventy-seven percent of the homes had a basement, and 83.9% had a garage. Houses were an average of 8.68 miles to the center of Boulder (the intersection of Broadway and Pearl Streets).

The average distance to farmland from a house was approximately a half mile and the average distance to openland was approximately three quarters of a mile. In the sample 7.3% of the households (107) were directly adjacent to farmland and 6.9% of households (101) were directly adjacent to openland No households were simultaneously adjacent to farmland and openland in the sample. [See Table 5.2]

Table 5.2 Summary Statistics for Housing Characteristics				
	Mean	Standard Deviation	Min	Max
House Characteristics				
Sale Price (2010 dollars)	414,595	261,568	94,807	2,607,191
Home Size (sqft)	1864	830	400	10,301
# of Baths	2.74	1.06	1	10
Age of House (years)	30.76	20.10	5	141
Garage	0.839	0.368	0	1
Basement	0.770	0.421	0	1
Geographical Characteristics				
Distance to center of Boulder (miles)	8.68	4.35	0.215	15.77
Distance to nearest farmland (miles)	0.50	0.36	0	2.38
Distance to nearest openland (miles)	0.70	0.52	0	2.31
Acreage of nearest parcel farmland	35.79	47.64	0	410.66
Acreage of nearest openland parcel	42.55	114.78	0.001	1,357.82

Directly adjacent to farmland	0.069	0.253	0	1
Directly adjacent to openland	0.073	0.260	0	1

Contact Procedures

Contact procedures were based on Dillman's (2002) Tailored Design Method and consisted of 4 coordinated mailings inviting individuals to participate in the study. Research has consistently found that repeated attempts made to contact a sample unit increases response rate (Dillman 2000, Schaefer and Dillman 1998). The Tailored Design Method (2002) is premised on the theory of social exchange that asserts that individual motivations are motivated by rewards (what one gains from an activity), costs (what one gives up or spends to obtain the rewards), and trust (the expectation that the rewards will outweigh the costs in the future). In the context of survey research, this suggests that rewards, costs, and trust are also important factors in response rates. Given this starting point, the modes of contact with potential study participants were structured in ways to encourage trust, lower costs, and provide rewards.

Letters and Postcards

The first mailing was a letter of invitation. In the letter I explained that I was conducting a study about farmland in Boulder County. The letter also explained the procedures for participating and the factors that made them eligible to participate. Participants were eligible if they were over 18 years of age and if they were a permanent resident of Boulder County. If they met the criteria, participants were directed to the internet website. The letter also stated that the study was completely voluntary and that if they did participate their information would remain anonymous. Included in the letter of invitation was a self-addressed, stamped postcard that provided a way for respondents to indicate that they (1) did not meet the eligibility requirements; (2) did not want to participate for other reasons; or (3) preferred a paper copy of the survey. The letter was printed on the Institute of Behavioral Science letterhead and my contact information

was provided for respondents that had additional questions or concerns. Approximately two weeks after the letter inviting participants into the study, a postcard was mailed. The postcard expressed appreciation for participants that had finished the study. It also appealed to those that had not participated to consider doing so. Contact information was also provided. Approximately two weeks following this postcard, a 2nd postcard was mailed to those respondents that had not completed the study. A final letter was mailed approximately 5 weeks after the initial letter inviting participants into the study. The final letter stressed the importance of collecting data from all viewpoints. Moreover, the tone of the letter was structured in a way that suggested we were asking for their help. The letter also stressed that other community members had completed the study, in an attempt to validate their actions of also participating. Both of these elements are suggested ways for increasing the rewards with participation (Dillman 2002).

Correspondence with potential study participants was coded with a 5-digit number. This number served two important purposes in the study. First, survey response rates are generally higher if social costs to potential participants are minimized. Minimizing the amount of personal information obtained from participants is one way of reducing social costs (Dillman 2000). Thus, the 5-digit code provided a way to link the respondent's survey answers to their geographic address thus making it unnecessary for us to request that information from respondents. Second, the code limited access to the survey. The survey was administered on a public website and was administered to a targeted sample. Therefore, passwords for accessing the survey were used as one way to assure that only the targeted audience participated.

Response Rate

The internet survey was conducted from May 2013 through mid-August 2013. Of the 1470 letters that were mailed, 183 were not deliverable and were marked as return to sender. Online surveys were completed by 231 households, and mail surveys were completed by 3. The response rate was 18.2%.

Challenges in Data Collection

During the course of this planned research effort three unexpected problems occurred that impacted the time involved in data collection and the response rate. These are described below.

Geographically Coded Recruitment: Mismatch

The first major challenge in collecting data was related to the geographic code assigned to each study participant as their personal password to access the online survey. As described above, each individual was assigned a 5-digit code that they were asked to provide when they accessed the online survey. This number was also geographically linked to the individual's home address, and served as a way to track online survey responses geographically without asking for individuals to provide their home address or names. A 5-digit code was included at the bottom of the initial recruitment letter and follow-up postcards.

I relied on the University of Colorado's Printing and Imaging Services (PIS) to print and mail the initial recruitment letter and follow-up postcards. They are outfitted to handle large mailings that are tracked geographically with a code, like the one I planned to use. However there was a breach in their system. I supplied the (PIS) staff with a list of 1500 addresses, each with a unique 5-digit code. Enclosed in the initial letter was a self-address stamped response postcard that allowed participants to elect to be withdrawn from the study or have a paper survey

mailed to them. Again, these postcards were stamped with the unique 5-digit code that was assigned by geographic address.

As a pre-test, we initially mailed 50 letters inviting participants into the study. After this pre-test was complete, the PIS staff was instructed to drop the remaining 1450 recruitment letters. At this point in the PIS's system of printing, stuffing envelopes, and mailing recruitment letters, the 5-digit code and the geographic address became mismatched. As a singular problem, this issue could be remedied by mere recoding my 5-digit pin numbers to the geographic address assigned by the PIS.

However, I was following the Dillman (2002) Tailored Design Method, which suggests mailing a reminder postcard approximately two weeks after the initial recruitment letter. Therefore the second postcard mailing, using the correct 5-digit code, was mailed before the problem was identified. This meant that households had now received letters of invitation to participate in the study with an incorrect 5-digit code and a follow-up postcard with an incorrect 5-digit code. Because the survey does not ask respondents to supply their name or household address, there was no way to know with any certainty, how each individual survey response coordinated with to a specific geographic location. This was problematic since key questions on the survey were based on relating an individual's geographic location to their responses.

Therefore, the initial survey recruitment process was stopped. Consequences of this error were nontrivial. A new sample was drawn from the sampling frame and I worked with the University's Human Research and Institutional Review Board to ensure approval of an increased sample size. However, drawing a new sample limited some of the geographic diversity that was initially present in the first sample. Specifically, in the first sample, 387 of the 1500 household address were simultaneously adjacent to farmland and openland. These households were of

special interest in helping identifying whether individuals were cognizant of the different land types surrounding their home. In the second sample drawn there were no households that were simultaneously adjacent to farmland and openland, because they had been included in the first sample.

Another significant implication of this problem resulted in approximately a 6 week delay in data collection. There were also significant financial costs associated with re-starting a survey based on mailed recruitments. However, the PIS covered all printing and mailing costs associated with recruitment.

Geographically Coded Recruitment: Leading Zeros on Passwords

The geographically coded recruitment also posed a challenge in data collection. In creating the unique IDs for my survey sample I created a code that would allow me to quickly look at the unique ID and know the geographic distance each household was to the nearest farmland. For example unique IDs that began with three leading zeros (00012) are properties that are directly adjacent to farmland. When the mailroom sent out the first reminder postcard to my second sample, they dropped all of the leading zeros when they printed the pin number on the postcard. Therefore, respondents might have a 2-digit pin instead of a 5-digit pin. This is problematic for a couple of reasons. First, it is confusing to the respondent and could cause them to question the legitimacy of the study. Developing trust with the potential respondent is a key element in achieving high response rates (Dillman 2002). Second, and perhaps most importantly, the online survey program, Qualtrics, was programmed to only allow participants with specific 5-digit codes participate in the study. Thus, if the respondent whose correct code was 00012 received a postcard that said your password is 12, tried to enter a 12 rather than 00012, they were

denied access. Potential study participants alerted me about this problem within 24 hours of the mailing via email which allowed me correct the problem within the Qualtrics program.

It is hard to estimate the impacts this error had on data collection; I cannot definitively estimate the impact this error had on individual's perception of the study. However, Dillman (2002) notes that a primary way to increase response rates is through methods that reduce social costs to participants. Incorrect or problematic pins represent an inconvenience and thus increase the social costs of participating. I did receive a total of 4 emails from individuals faced with this issue and 2 of them completed the study while the other 2 did not. Interestingly one of the 2 that completed the study was a member of my church. I was unable to notice any discernible trend based on completion dates and mailing drop dates.

Internet Survey Administration

Another challenge in data collection had to do with accessing the survey on the internet. The survey was administered through the University of Colorado's Institute of Behavioral Science server. During the course of the study I received email correspondence from potential respondents stating that they had problems accessing the survey through the internet. Often times the respondent included the correct link to the survey in the body of their email while noting that the internet link did not work. My general response to these individuals was to encourage them to access the survey from a different internet browser (e.g. Firefox, Google Chrome, and Internet Explorer). Of the sixteen that emailed with issues, 13 completed the study, 2 did not, and 1 was unable to track because they did not identify themselves in their email. One individual emailed saying he was able to access the survey but unable to take it because it did not appear correctly on his screen. This individual did complete the study. [See Table 5.3]

TABLE 5.3 Survey Administration Issues			
TYPE OF ISSUE	Completed	Did Not Complete	Not sure
Survey URL did not work	13	2	1
Leading Zeros	2	2	0
Faulty Screen	1		0
Pin number assigned incorrectly		1	

DESCRIPTIVE RESULTS

Of the 1470 letters that were mailed, 183 were not deliverable. Online surveys were completed by 231 households, and mail surveys were completed by 3. Two surveys were removed because they did not own their home. An additional 34 surveys were removed because of incomplete responses on key question leaving the final sample at 197.

Characteristics of Survey Respondents

The average age of the respondent was 53 years old. Very few of the respondents were less than 35 years old (5.86%). There were more female (55.3%) respondents than male (44.3%). Almost all survey respondents identified “white” as their racial group (92%). Seventy-five percent of the respondents were married. Overall, respondents were more educated than Boulder County, 91% of the respondents were college graduates and a majority of respondents had an advanced degree (49%). Comparatively, the 2010 U.S. Census reported that 57% of the population were college graduates. Fifty-nine percent of the respondents had no children under the age of eighteen in the household. A majority of the respondents (59%) had a household income greater than \$100,000. In comparison, in 2013 the U.S. Census Bureau reported a median income household income of \$57,112 and a median family income of \$113,681 for Boulder County, Colorado (U.S. Census Bureau 2013) [See Table 5.4]. All of the respondents owned their home (this was part of the sampling design). On average, respondents had owned their

home for 9.2 years. Fewer than 5% of respondents owned their home for more than 12 years or less than 3 years. Comparatively, according to the American Community Survey, 22% of single family home owners have owned their homes for 10 to 19 years, 12% have owned their homes for 20 to 29 years, and about 15% have owned their homes for more than 30 years (U.S. Census Bureau 2010).

Table 5.4 Characteristics of Survey Respondents		
		Mean or Percentage
Age		52.6
Gender (%)		
	Male	44.7
	Female	55.3
Education (%)		
	Some College/Trade School	6
	College Degree	44
	Advanced Degree	49
Household Income (%)		
	<\$49,999	7.1
	\$50,000 – \$74,999	17.3
	\$75,000 - \$99,000	14.7
	\$100,000 - \$124,999	21.3
	\$125,000 - \$200,000	24.4
	>\$200,000	15.2
Married (%)		75.7
Kids in household (%)		
	>18	59.0
	<18	42.0
Race (%)		
	White	92
	Other	8

The spatial distribution of survey respondents was fairly evenly distributed across each of the five strata. Twenty-two percent of respondents live directly adjacent to farmland (defined as less than 30 feet from farmland); 20% live greater than 30 feet from farmland but less than a quarter mile; 15% live between a ¼ mile and a ½ mile from farmland; 17% live between ½ mile

and $\frac{3}{4}$ of a mile from farmland; 13% live between $\frac{3}{4}$ of a mile and 1 mile from farmland and 13% greater than a mile from farmland. At the same time, the proportion of respondents within each strata did not reflect the proportion of households within the target population. [See Table 5.5]. Specifically, the completed responses had a larger proportion of responses from individuals living directly adjacent to farmland than the number of households in the target population. This was expected given the intentional over-sampling of this strata.

TABLE 5.5 Spatial Characteristics of Survey Respondents⁹⁵

Strata	Distance from nearest agricultural land	Number of households in Target Population (%)	Sampled Population	Completed Responses
0	0 – 30 feet	1,158 (4.8)	750	43 (22%)
1	> 30 feet and < $\frac{1}{4}$ mile	8,277 (34.6)	150	40 (20%)
2	$\frac{1}{4}$ mile – $\frac{1}{2}$ mile	5,739 (24.0)	150	29 (15%)
3	$\frac{1}{2}$ mile – $\frac{3}{4}$ mile	4,975 (20.8)	150	34 (17%)
4	$\frac{3}{4}$ mile – 1 mile	2,685 (11.2)	150	26 (13%)
5	> 1 mile	1,067 (4.46)	150	25 (13%)
TOTAL		23,901 (100)	1500	197 (100)

Agrarian Heritage

Seventy percent of the respondents have never lived on a farm. Twenty seven percent of respondents said that they had no history of farming in their family while 32.5% indicated that their parents' generation was involved in farming. Of the respondents that had ever lived on a farm (43 respondents), 74% had lived on a farm for more than 12 consecutive months. Although I could find no good source of data regarding regional and/or national statistics about familial ties to farming, the 2007 U.S. Census of Agriculture reported that 1.9% of the labor force was employed in agriculture (USDA 2009).

Interactions with Farmlands

In the survey section that asked respondents about the way they experience farmland in their daily life, respondents were asked about the frequency of involvement with various farm related activities. Almost all respondents (77%) viewed property on drives to and from their property on a daily basis. Approximately a third of the respondents (33%) viewed farmland from their property daily while 60% never did. Interestingly, approximately 7% of the respondents indicated that they viewed farmland from their property weekly. The majority of respondents recreate in and around farmland at least monthly (85%) with 60% percent of respondents recreating in and around farmland at least weekly. Forty-nine percent of respondents stated that they shop at a farm stand or you-pick patch at least one time a month while approximately 14% shop there weekly. A small portion of respondents interact regularly with farmland by pasturing horses (9% daily and 15% weekly). Almost all survey respondents never work or volunteer at farms (92%). A little more than half of respondents (51%) participate in farm events annually (County Fair, Agriculture tour, horse show).

Place Attachment

Part of the survey consisted of seven place attachment statements, adopted from a study by Raymond and Brown (2010). Attachment was measured on a 5-point scale with 1=strongly disagree and 5 = strongly agree. Sixty percent of respondents indicated that they agreed or agreed strongly with the statement “I would feel less attached to my community if there was less farmland.” Seventy percent of respondents also agreed or agreed strongly with the statement “Recreating in and around the farmland in Boulder County is very important to me.” For many respondents, the farmland provided a link to the environment. Seventy-seven percent of the

respondents agreed or agreed strongly with the statement “When I spend time in or around farmland (walking, driving by, viewing from home, etc.) I have a sense of oneness with the natural environment and 77% of respondents agreed or agreed strongly with the statement “I am attached to the natural environment provided by farmland in Boulder County.” Respondents indicated that belonging to groups associated with farmland in the county or interacting with the farming community was less important. Forty-two percent of respondents were neutral about the statement “Belonging to groups associated with farmland in Boulder County is very important to me” and 44% disagreed with the statement. Responses also clustered around the center (disagree, neutral, agree) for the statement “Interacting with the farming community in Boulder County is very important to me”.

Preferences for Protection Status

Seventy-eight percent of the respondents were aware that farmland was protected in Boulder County and 72% of respondents stated that they had known for more than five years. Seventy-seven percent indicated that they think farmlands need to be protected, 10% did not think so, while 13% indicated that they did not know whether farmlands should be protected. When asked whether government should compensate farmers for the nontraditional benefits produced by agriculture such as open space or wildlife habitat, 48% agreed or agreed strongly, 23% disagreed or disagreed strongly and 29% were neutral. However, 71% of respondents agreed or agreed strongly that government should take steps to protect farmlands that provide nontraditional benefits to communities.

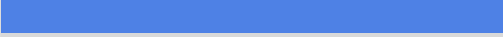
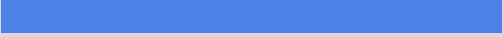
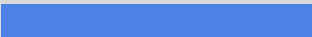
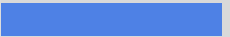
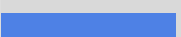
Preferences for Management Plans

In one section of the survey respondents were asked “Once farmlands are protected they have to be managed. When creating management plans for protected farmlands, which of the following aspects are important to you?” Respondents were instructed to select all that apply. The following question then asked respondents to rank, from most important to least important, those items they thought were the most important for management once farmlands had been protected. The items selected with the greatest frequency included: environmental aspects (82%) preservation for future generations (76%), rural character (76%), open space (75%), and scenic beauty (67%). Of the items selected, items that were ranked highest included (based on weighted ranks): environmental aspects (ranked 1st), open space (ranked 2nd), re-localized food system (ranked 3rd), rural character (ranked 4th), and preservation for future generations (ranked 5th) [See Table 5.6]. These findings are consistent with several studies that have identified four primary and sometimes intersecting benefits the public expects from farmland protection efforts including: (1) nonmarket agricultural services; (2) environmental amenities; (3) growth control services; and (4) open space provision (Bergstrom and Ready 2009, Duke and Aull-Hyde 2002, Duke and Ilvento 2004, Kline and Wichelns 1996a, Kline and Wichelns 1998). Moreover, other studies have also found that individuals that are more likely to protect agricultural lands, are also more likely to be motivated by environmental concerns (Duke and Ilvento 2004, Kline and Wichelns 1996b) and in this study in this study, 83% of respondents indicated that it was important to protect agricultural lands.

Interestingly, no aspects directly tied to traditional agricultural productions systems were ranked in the top five, measured in terms of the frequency of being selected as important. Re-localized food system was 6th followed by agricultural heritage and jobs for the farming

community. This suggests that respondents are largely more concerned with the nontraditional non-market goods provided by agricultural lands. This finding is also consistent with other studies that have found that largely, efforts to support farmland protection are generally motivated by multiple interests; particularly interests that are not directly tied to agricultural production (Hellerstein et al. 2002).

Table 5.6 Preferences for Management Plans for Protected Agricultural Lands

(N=197)		# that selected	% that selected this option	% that ranked it # 1
Environmental aspects (biodiversity, wildlife habitat)		187	92%	23.4%
Preservation for future generations		174	88%	10.4%
Rural Character		174	88%	15.3%
Open Space		172	87%	12.2%
Scenic beauty		154	78%	4.5%
Re-localized food system (more local control with better access to local foods)		127	64%	9.0%
Agricultural heritage		109	55%	3.6%
Jobs for the farming community		100	51%	5.9%
Recreational opportunities		99	50%	1.8%
Economic factors associated with farming		95	48%	4.1%
Food security		91	46%	3.6%
Crop production levels		78	40%	5.4%
Attractiveness to visitors		77	39%	0%
Community relationships		69	35%	0.45%
Ability for the public to participate in the management plan		61	31%	0%
Other		7	4%	0.45%
None, I do not believe any of the items listed above are important to consider when creating management plans		4	2%	0%

Preferences for Limiting Development and Farmland Practices

Another measure of preferences for *back end* aspects of farmland protection was designed to assess whether respondents viewed farmland protection as a tool to limit development or as a tool to impact agricultural practices. Respondents were asked the question: “If Boulder County protects farmland, what are you most concerned with limiting?” Respondents were asked to indicate their preference using the following answer choices: limiting future development; limiting the type of farmland practices; I do not know; or I do not have an opinion. Fifty-two percent of respondents indicated that they are most concerned with limiting development when they support efforts to protect agricultural lands compared to approximately 6.6% of respondents who indicated that they were most concerned with limiting the types of agricultural practices on protected lands. This finding is not unexpected, in light of the prevalence of the environmental amenities respondents were most concerned with managing on protecting agricultural lands [See Table 5.7].

TABLE 5.7 Preferences for Farmland Use and Stakeholder Involvement				
Measures of Preference	Sample Statistic			
	Mean or Percentage	Standard Deviation	Max	Min
Limitation Goals of Farmland Protection				
Limit Development (LIMITDEV)	52.0		0	1
Limit Type of Agricultural Practices (LIMITAG)	6.6		0	1
Limit Type of Ag & Limit Development (LIMITBOTH)	23.9		0	1
Do Not Know or No Opinion	17.5		0	1
Involvement in Management Plan				
Farmer	4.52	0.82	1	5
Agricultural Experts (crop consultants, university extension agent, etc.)	3.85	0.96	1	5
Agency protecting the farmland, (land trust, city/county government, etc.)	3.80	1.09	1	5
People living adjacent to farmland	3.27	1.08	1	5
General Public	3.15	1.11	1	5
Elected County Officials	2.89	1.12	1	5

Government Support				
Government should compensate farmers for nontraditional benefits produced by agriculture	3.345	1.101	0	5
Steps should be taken by government to protect farmlands that provide nontraditional benefits	3.870	0.979	0	5
Support Protection Efforts Scale				
In general, do you think that farmland needs to be protected?	0.826	0.307	0	1
Have you ever supported efforts to protect farmland (e.g., ballot initiatives, private donations)?	0.826	0.380	0	1

Preferences for Stakeholder Involvement in Management Plan Decision Making

The survey also measured respondents' preferences for stakeholder involvement in the decision-making process regarding the post-protection management of farmlands. Stakeholder types included farmer, agricultural expert, agency protecting the farmland, people living adjacent to the protected farmland the general public, and elected county officials. I asked respondents the question: "If public funds are used to protect farmlands in your county, what level of involvement do you think each of the following stakeholders should have in the decisions about how the protected farmlands are managed?" Response choices included none (coded 0), some (coded 3) and a lot (coded 5); the higher the code in these responses, the higher level of preferred involvement. Overall, farmers received the highest mean score (4.52) and elected county officials received the lowest mean score (2.89) [See Table 5.7].

DATA ANALYSIS

In this section I present results from the analysis undertaken to address two key questions of this investigation. First, to better understand whether preferences for protected farmlands vary spatially, I examine the relationship between the distance an individual lives from farmland and their preferences for the management of farmlands. Second, to understand how respondents'

preferences for limiting land uses on protected agricultural lands are related to social and cultural factors, I model the relationship between stakeholder preferences for limiting land uses as a function of place attachment, cultural and social ties to agriculture, level of regular interaction with agriculture, and demographic characteristics.

This section begins with a description of the variables used in both analyses. Next, I present results from the analysis examining the spatial relationship between preferences and geographic distance to farmlands. After this, I step through the process used to model the relationship between preferences and a set of social and cultural factors. This is followed by a presentation of the model results and a discussion. Finally, the chapter concludes by discussing the limitations of the study and future directions for research.

MEASUREMENTS AND VARIABLES

Outcome Variables

I operationalized preferences for protected agricultural lands for these analyses in four ways: (1) as a preference for protection status of nearest farmland; (2) as a preference for government support of farmland protection efforts; (3) as a preference for stakeholder involvement in the decision making process associated with the creation of management plans; and (4) as a preference for limiting development and/or farmland practices when agricultural lands are protected.

Measuring Preferences for Protection Status

Two categorical variables measured respondents' preferences for protection status of the farmland nearest to their home. The variable PROTECT is a binary measure indicating whether a

respondent thinks farmlands need to be protected (1 = yes, 0 = no). The variable SUPPORT is a binary measure indicating whether a respondent has supported efforts to protect farmlands (1 = yes, 0 = no).

Measuring Preferences for Government Support

I operationalized government support by creating two categorical variables from two questions about the role of government in protecting farmlands. Respondents were asked to indicate how strongly they agreed (coded 5) or disagreed (coded 0) with the following statements: “Government should compensate farmers for nontraditional benefits produced by agriculture” and “Steps should be taken by government to protect farmlands that provide nontraditional benefits.” These measures were adapted from a study by Mathews (2011).

Measuring Preferences for Stakeholder Involvement

Five outcome variables measured respondents’ preferences for stakeholder involvement in the decision-making process regarding the post-protection management of farmlands. Stakeholder types included farmer (FARMER), agricultural expert (AGEXPERT), agency protecting the farmland (LANDTRUST), people living adjacent to the protected farmland the general public (PUBLIC), and elected county officials (OFFICIAL). Respondents were asked to indicate the level of involvement they thought each stakeholders should have in the decisions about how the protected farmlands are managed. Response choices included none (coded 0), some (coded 3) and a lot (coded 5); the higher the code in these responses, the higher level of preferred involvement. Responses were summed to create the continuous variables. [See Table 5.7].

Measuring Preferences for Limiting Land Uses

To measure preferences for limiting land uses on protected agricultural lands, survey participants were asked what they were most concerned with limiting: limiting future development; limiting the type of farmland practices; I do not know; or I do not have an opinion. Responses to this question were used to construct three binary dependent variables: LIMITDEV, LIMITAG, and LIMITBOTH. These categories are mutually exclusive. Variables are coded as one if respondents selected it and zero if they did not.

Independent and Control Variables

This study was concerned with understanding an individual's preferences for farmland in relationship to five sets of independent variables: a set of variables measuring respondent's cultural and social ties to farming; a set measuring respondent's level of place attachment; a set identifying respondent's level of interaction with agricultural lands; and a measure identifying respondent's geographic proximity to agricultural lands. Control variables were also included in this study. These measures, adapted from Sharp and Adua (2009), are described below and summarized in Table 5.8.

Cultural & Social Ties to Farming

I operationalized cultural ties to farming by asking respondents whether there was a farming history in the family (yes coded 1 and no coded 0). Respondents were asked to answer this question across the following categories: your generation, your parent's generation, your grandparent's generation, before your grandparent's generation. I reduced this question into a scale (AGHIST) (Cronbach's alpha = 0.697). Because the alpha scale reliability coefficient was

not above 0.70, I used factor analysis to confirm that all of the items should be in one scale. The exploratory factor analysis identified 1 factor with all four variables (your generation, your parent's generation, etc.) loading at 0.40 and the Eigenvalue was 2.33. Therefore, I constructed the variable AGHIST as a scale. The mean of AGHIST is 0.323 (0 = no familial ties, 1= 4 generations of familial ties).

Respondents were also asked what their relationship was to the farming community by indicating their social connectedness as individuals (formerly and currently) to agriculture and farming or to other individuals (relative, close friend, and acquaintance) involved in agriculture and farming. I summed these responses and divided by number of possible ties to create a farm-connectedness scale (0=no ties, 1 = maximum number of ties). The higher the number on this scale, the greater the number of social connections and individual has to other individuals involved in the farming community. The mean score for FARMTIES was 0.136.

Place attachment

I operationalized place attachment using a 5-dimensional model adapted from Raymond, Brown and Weber (2010). Respondents were asked to indicate how strongly they agreed or disagreed with the following 7 statements: (1) "I would feel less attached to my community if there was less farmland" (2) "Belonging to groups associated with farmland in Boulder County is very important to me" (3) "Interacting with the farming community in Boulder County is very important to me" (4) "I am attached to the farmland in Boulder County" (5) "When I spend time in or around farmland (walking, driving by, viewing from home, etc.) I have a sense of oneness with the natural environment" (6) "I am attached to the natural environment provided by the farmland in Boulder County" and (7) "Recreating in and

around the farmland in Boulder County is very important to me.” Responses choices included: strongly agree (coded 5), agree (coded 4), neutral (coded 3), disagree (coded 2) or strongly disagree (coded 1). I first summed the score and tested their item-to-total and inner-item correlations and found that they were all above 0.5 and 0.3, the thresholds for deletion (Norusis 2005). Therefore, a place scale (Cronbach’s alpha = 0.849) was created by summing the scores for each statement and averaging them. The maximum value of the scale variable (PLACE) is 1, indicating a strong level of place attachment and the minimum value is 0, representing no discernible degree of place attachment. The mean score of PLACE is 0.722.

Interactions with Farmlands/Rural Recreation Scale

In this study I measured interactions with farmland by asking participants to indicate how often they interact with farmland in the following ways: view from property; view on drives to and from property; recreate in and around (hike, bike, bird watch, etc.); shop at farmstand, you-pick patch, corn maze; farm or work as a paid employee at a farm or volunteer; and participate in a farm event (e.g. County Fair, agricultural tour, horse show). Response categories include never (coded 0), annually (coded 1), monthly (coded 2), weekly (coded 3) and daily (coded 4). These measures were adapted from a set of questions in a study by Sharp and Adua (2009).

I constructed two continuous variables from this data (REC OFTEN and REC RARE). I first summed responses to these items and analyzed the item-to-total and inter-item correlations. The overall alpha reliability score was 0.531 suggesting that all of the items were distinct. However, a clear pattern was identifiable in the raw data. There were certain types of interactions with farmlands that were much less frequent than others; for instance a majority of respondents never pastured horses (81.4%) or work/volunteer on a farm (93.0%) suggesting distinct

dimensions of interactions. Exploratory factor analysis identified 2 factors with Eigenvalues greater than 1 with multiple variables loading at greater than 0.4, the threshold for inclusion (Gorsuch 1983). The underlying variables that contributed most to Factor 1 (Eigenvalue = 1.66) were those interactions with farmland that individuals participated in more frequently: views from property, view on drives to and from property, recreate in and around, and shop at farmstands. The underlying variables contributing to Factor 2 (Eigenvalue = 1.65) included the types of interactions that respondents never or very rarely participated in: working/volunteering on a farm, pasturing horses, and participating in a farm event. Therefore, I created two variables, INTERACTOFTEN (mean = 0.539) and INTERACTRARE (mean = 0.110). Each has a maximum value of one and a minimum of zero.

Geographic Distance to Farmlands

To identify whether an individual's preferences were impacted by their geographic distance to agricultural land, I created a continuous variable representing the geographic distance, (as the bird flies) from the edge of an individual's property to the edge of the closest parcel of agricultural land (of any protection status: private, conservation easement, or County-owned). I used spatial data acquired from the Boulder County's Assessor's Office and the Boulder County Land Use Department and GIS to construct the DIST variable. The average DIST is 2,509 feet, or approximately a quarter mile. The maximum distance any respondent is from agricultural land is 12,448 feet (2.36 miles) and the minimum distance is 0 feet (directly adjacent to agricultural lands).

Control Variables

I controlled for those socio-demographic factors that have been related to farmland preferences in previous studies. Namely, these include income, measured as a categorical variable ranging from less than \$25,000 to more than \$200,000 at increments of \$25,000. Age was treated as a continuous variable. Length of residence measured the number of years respondents' had resided in their current home. Gender is a dichotomous variable (male=0, female=1).

TABLE 5.8 Descriptive Statistics for Independent Variables					
VARIABLES		Sample Statistic			
		Mean	Standard Deviation	Max	Min
Cultural Ties to Farming (LIVEFARM)					
Binary, yes=1					
	Have you ever lived on a farm?				
	Yes	0.230	0.422	0	1
Is there are history of farming in your family?					
Summed, continuous scale					
	AG HIST SCALE (alpha reliability = 0.697)	0.320	0.323	0	1
	Your generation	0.115	0.320	0	1
	Your parent's generation	0.350	0.478	0	1
	Your grandparent's generation	0.475	0.500	0	1
	Before your grandparent's generation	0.340	0.475	0	1
	None	0.300	0.459	0	1
	Don't know	0.065	0.247	0	1
What is your relationship to the farming community?					
Summed, continuous scale					
	(FARMTIES)	0.136	0.167	0	1
	Myself currently	0.450	0.207	0	1
	Myself formerly	0.055	0.229	0	1
	Relative	0.120	0.326	0	1
	Close friend	0.165	0.372	0	1
	Acquaintance	0.295	0.457	0	1
	None	0.420	0.495	0	1
Place Attachment Measures					
Summed, continuous scale					

PLACE ATTACH (alpha reliability = 0.849)	0.722	0.140	0	1
I am attached to the natural environment provided by the farmland in Boulder County.	4.01	0.908	0	5
When I spend time in or around farmland (walking, driving by, viewing from home, etc.) I have a sense of oneness with the natural environment.	3.97	0.856	0	5
Recreating in and around the farmland in Boulder County is very important to me	3.94	0.949	0	5
I am attached to the farmland in Boulder County.	3.75	0.940	0	5
I would feel less attached to my community if there was less farmland.	3.73	1.051	0	5
Interacting with the farming community in Boulder County is very important to me.	3.20	1.026	0	5
Belonging to groups associated with farmland in Boulder County is very important to me.	2.70	0.902	0	5
Interactions with Farmland				
Summed, continuous scale				
Factor 1: REC OFTEN (Eigenvalue=1.66)	0.575	0.199	0	1
View on drives to and from property	3.646	0.731	0	5
Recreate in and around (hike, bike, bird watch, etc.)	2.551	1.133	0	5
Shop at farmstand, you-pick patch, corn maze	1.593	0.964	0	5
View from property	1.453	1.879	0	5
Factor 2: REC RARE (Eigenvalue=1.65)	0.110	0.158	0	1
Participate in farm event (County fair, agricultural tour, etc.)	0.668	0.680	0	5
Pasture horses	0.622	1.333	0	5
Work as a paid employee or volunteer at farm	0.155	0.659	0	5
Geographic Distance to Farmland (Feet)	2509.652	2297.252	0	12,488

PREFERENCES AND DISTANCE TO AGRICULTURAL LAND

I constructed contingency tables to examine the relationship between proximity to farmland and respondent preferences for protected agricultural lands (described above). In all of these analysis significant relationships were found (i.e. the probability of chi square was greater than 0.60 in all tables constructed) between an individual's geographic distance to farmland and their preferences for: protection status of the nearest farmland; government support for protecting agricultural lands; limiting the development of land or limiting farmland practices; or the involvement level of different stakeholder groups.

MODEL ESTIMATION

Model 1: Preferences for Limiting Land Uses on Agricultural Lands

In these models I estimate respondents' preferences for limiting land uses on protected agricultural lands as a function of place attachment, cultural ties to agriculture, social ties to agriculture, level of interaction with agricultural lands, geographic proximity to agricultural lands, and demographic characteristics. The outcome variables, LIMITDEV, LIMITAG, and LIMITBOTH, are binary. Thus, a logit function was used to estimate the probability that an individual would be most concerned with limiting future development and limiting farmland practices when farmland is protected represented as:

$$\Pr(Y = 1 | X_1, X_2, \dots, X_k) = F(\beta_0 + \beta_1 X_1 + \beta_2 + \dots + \beta_K X_K)$$

The models were estimated in STATA 12.1. Preliminary diagnostic tests for multicollinearity indicated that no independent continuous variables had correlations over 0.5. To check for specification error, I used the linktest in STATA 12.1. These tests indicated that the models were properly specified, the linear predicted value was statistically significant ($p < 0.05$) while the linear predicted value squared was not ($p = >0.05$) in all three models, confirming the model specification. The Hosmer and Lemeshow's goodness of fit test also indicated that the predicted frequency and the observed frequency were closely matched ($p > 0.3737$) in all 3 models.

Model Results

Model 1A: Limiting Both Development and Type of Farmland Practices

The outcome variable in this model is preferences for limiting land uses. Success is defined as "limit development and limit types of farmland practices" (i.e., the respondent selected both limit development and limit types of farmland practices). The only variable that was significant above the 0.05 level was income. Results are presented in Table 5.9. The model

estimated that for every one unit increase in income (measured categorically at \$25,000 increments) we expect a 0.332 decrease in the log-odds of having preferences for both limiting development and limiting types of farmland practices if the County protected agricultural lands. As an individual increases income categories, the odds that they will have preferences for limiting both development and types of farmland practices on protected agricultural lands decreases by 0.718.

Model 1B: Limiting Development

Model 1B measures how the probability of being concerned with limiting development when farmland is protected varies among individuals based on the sets of independent variables described above. Only two variables were statistically significant from zero, and therefore impacted the probability of a respondent being concerned with limiting development when the County protects farmlands. First, for a one unit increase in an individual's level of participation in agricultural related activities very rarely participated in - working/volunteering on a farm, pasturing horses, and participating in a farm event –the odds of an individual being concerned with limiting development decrease by 2.91 (z score = -2.54). The model also indicates that for every one unit increase in an individual's level of support for protection efforts (measured as a scale of having supported efforts in the past and thinking that farmlands need to be protected), we expect a 3.73 increase in the log-odds of being concerned with limiting development, holding all other independent variables constant (z score = 2.97). In terms of odds ratios, for every unit increase in being in favor of government efforts to protect agricultural lands, the odds of an individual being concerned with limiting development increases by a factor of 41.5. In other

words, an individual that supports efforts to protect farmlands is 41 times more likely to be concerned with limiting development than an individual that does not support protection efforts.

Model 1C: Limiting the Type of Farmland Practices

Model 1C measures the probability of being concerned with limiting the type of farmland practices when farmland is protected. The model indicates only income was significantly related to an individual's likelihood of being concerned with limiting the type of farmland practices when the County protects farmlands, (z score = -2.71). The impact was negative, and as an individual's income increases by one unit (measured categorically in \$25,000 increments), we expect a decrease of decrease 0.302 logged odds in their likelihood of being concerned with limiting type of agricultural practices, the odds decrease by 0.74.

TABLE 5.9 Model 1: Logit Results

Question: When Boulder County protects agricultural lands, what are you most concerned with limiting?

Outcome Variable =	Model 1A LIMIT BOTH			Model 1B LIMIT DEVELOPMENT			Model 1C LIMIT TYPE OF FARMLAND PRACTICES		
	b	z	Odds Ratio	b	z	Odds Ratio	b	z	Odds Ratio
Age	0.005	0.300	1.005	-0.118	-0.68	0.988	0.003	0.23	1.003
Education	-0.253	-1.54	0.776	0.025	0.16	1.025	-0.221	-1.54	0.801
Income	-0.332**	2.68	0.718**	-0.027	-0.21	0.973	-0.302**	-2.71	0.740**
Gender	-0.223	0.57	0.800	-0.132	-0.32	0.876	-0.202	-0.57	0.817
Reside	-0.067	-1.24	0.935	-0.0360	-0.85	0.964	-0.032	-0.88	0.977
Farm Ties	0.128	0.10	1.136	-0.342	-0.28	0.710	0.905	0.83	2.473
Aghist Scale	0.151	0.21	1.164	0.666	0.91	1.946	0.235	0.37	1.264
Live Farm	-0.375	-0.67	0.688	-0.757	-1.34	0.469	-0.187	-0.38	0.830
Place Attach	3.05	1.84	21.205	2.392	1.38	10.940	2.87	1.89	13.353
Rec RARE	-1.903	-1.42	0.149	-2.012**	-2.54	0.055**	-0.634	-0.58	0.530

Rec OFTEN	-1.010	0.55	0.333	-0.708	-0.74	0.493	-0.366	-0.45	0.693
Gov't Scale	2.489	1.96	12.005	3.726**	2.97	41.51**	-0.103	0.924	0.902
Distance to Ag	4.52E-05	0.55	1.000	7.54E-05	0.76	1.000	2.2E-05	0.776	1.000
Intercept	-0.5222	0.30	0.594	-1.553	-0.81	0.212	0.681	0.691	1.95
LR chi2 (14)	27.74			33.04			18.47		
N	197			197			197		
Prob>chi2	0.0102			0.0017			0.1405		

DISCUSSION

In this study I sought to identify the frequency and strength of different management preferences (desired land uses) for protected farmlands. Respondents in this study were supportive of efforts to protect agricultural lands, pursued protection primarily as a way to limit development, and were most concerned with managing protected agricultural lands to maintain the environmental aspects. Moreover, respondents felt that farmers should have the most involvement in the management decisions on farmlands protected using public funds. This knowledge is relevant to the public policy process regarding the planning of management for protected agricultural lands in this community. First, it suggests that in general, individuals understand farmland protection as a tool to accomplish multiple aims, with agricultural related aspects less prominent than environmental aims. Second, it suggests that land protection agencies may not need to protect agricultural lands to achieve the goals individuals have in mind when they support farmland protection. Moreover, as others have noted (e.g. Kline and Wichelns 1998), if individuals support efforts to protect agricultural lands because, to them, it is a tool for limiting development and protecting environmental amenities, conflict may ensue. Moreover, it may not be the most economically efficient way to achieve the public's demand (Duke and Ilvento 2004, Kline and Wichelns 1998).

The finding, that farmers should be the most involved in the management decisions on agricultural lands that have been protected using public funds, is also noteworthy. In the context of this study, three public hearings were held where the general public was able to voice their concerns and thoughts about how the protected agricultural lands should be managed suggesting some level of distrust or concern that the farmers should not be the most prominent decision maker. This notion was furthered during the course of the stakeholder interviews (Chapter 4). Thus, on the one hand, this finding might suggest that in fact, large portions of the population recognize the farmers ought to have the capacity to make those decisions. What's more, in the context of this survey, a majority of respondents indicated that environmental amenities were the most important aspect to consider when managing protected agricultural lands. This could suggest that respondents trust the farmers to manage the lands in a way that protects the environmental amenities associated with the lands. On the other hand, the finding could also suggest that the general public is unaware of management issues and by default chose farmer because it seems like a reasonable choice. Given the response, and the ambiguity in interpreting the finding, future research should seek to better understand why individuals chose this response.

In this study, one of the most important post-protection management concerns chosen by respondents was preservation for future generations. This finding is interesting because it suggests that individuals support efforts partly for the existence values, i.e. respondents protect farmland because they derive value from knowing simply that the lands exist (Freeman 2003). In the context of post-protection management preferences, respondents that support protection based on existence values may have little interest in the management aspects.

A second aim of the study was to relate preferences for protected agricultural lands to an individual's level of place attachment, cultural and social ties to agriculture, level of regular

interaction with agriculture, geographic proximity to protected farmlands, and level of support for protection efforts. Across all of the models estimated to assess these relationships, only one variable was a significant predictor of the probability that an individual would be concerned with limiting development, limiting types of farmland practices, or limiting both.

In Model 1b, as an individual's level of interacting in rare agricultural-related activities increases, the odds of being concerned with limiting development decreases. This finding could suggest that individuals that recreate in and around agricultural lands recognize the need to develop them partially in order to enjoy them. In contrast, Sharp and Adua (2009) found that individuals that interact in outdoor recreational activities expressed stronger affinity for agriculture in general, and for support of farmland protection more specifically. Farm protect, a dummy variable indicating whether the respondent had supported efforts to protect farmland in the past, significantly and positively increases the odds that an individual will be concerned with limiting development.

Model 1a and 1c indicate that as income increases, the probability that an individual will be most concerned with limiting the type of farmland practices (Model 1c) and limiting both (Model 1a) is reduced. Generally farmland protections studies have found that income is positively related to WTP for protection effort (Bergstrom and Ready 2009, Kline 2006). Although the questions are different, the previous studies suggest that as income increases, preferences for protection (i.e. limiting something) also increase. Therefore, this finding is curious and could suggest that respondents with higher incomes are in general less supportive of efforts to protect agricultural lands. However, a contingency table analysis indicated that there was not a significant difference (probability $\chi^2 = 0.203$) among those that support efforts to protect agricultural lands across the different income categories. Likewise there was not a

significant relationship (probability $\chi^2 = 0.456$) between income and belief that government should help protect agricultural lands.

Perhaps more importantly, income is a variable that is routinely assessed in farmland protection studies and does not constitute a variable that captures the ways that individuals develop value and meaning for agricultural lands through social relations.

The variable farm protect is a variable that gets at an individual's level of public engagement in social issues. The other variables thought to influence preferences for agricultural lands were not significant in the models. The variable accounting for geographic distance between an individual's property and the nearest parcel of agricultural land (distance to ag) did not impact the likelihood of exhibiting preferences for the goals of farmland protection. This finding is consistent with a study by Sharp and Adua (2009) who found that once they controlled for an individual's level of rural recreational behavior, the effect of being classified as "more rural" (defined as a geographic proximity to agricultural lands) was no longer positively related to an individual's concern for protecting farmland.

LIMITATIONS

A primary limitation with this study is the lack of direct, simple, questions asking respondents whether they are concerned with the protected agricultural lands in the County. Going into the study I was of the mindset that individuals do have preferences for the post-protection aspects of protected agricultural lands and the goal of the survey was to identify and quantify those preferences. Rather, a more complete study would have also simply asked: *Do you have any concern about the post-protection aspects of the agricultural lands protected in your community?* Similarly, the study would also benefit from simply asking respondents whether they care about the post-protection management of the protected lands. In this study, respondents

were also asked to identify which aspects of management they were most concerned with rather than first establishing the extent to which there is a concern at all. Therefore, simpler, direct questions would allow for a deeper understanding of preferences for protected agricultural lands deal more directly with preferences for management. Moreover, the structure of these questions made data analysis unnecessarily complicated.

Another limitation, as already detailed in the methods section of this chapter, this study also faced significant obstacles in terms of the initial administration of the survey. In terms of translating to overall study limitations, the biggest implication of these challenges relates to the response rate of the study, primarily in terms of the unknown number of potential respondents that were unable to access the survey with their password.

CONCLUSION

A primary goal of this study was to identify preferences frequency and strength of different management preferences (desired land uses) for protected farmlands and relate them to the following social and spatial characteristics: an individual's level of place attachment, cultural and social ties to agriculture, level of regular interaction with agriculture, geographic proximity to protected farmlands, level of support for protection efforts, and demographic characteristics.

The primary findings from this study are that respondents are in general supportive of efforts to protect agricultural lands, pursue protection primarily as a way to limit development, and are most concerned with managing protected agricultural lands to maintain the environmental aspects. Moreover, respondents felt that farmers should have the most involvement in the management decisions on farmlands protected using public funds. In this

study, the only social factor that statistically related to preferences was an individual's level or involvement in rare rural activities such as attending a state fair.

CHAPTER VI

HEDONIC PRICING MODEL

In this chapter I present results from a hedonic pricing model, a traditional nonmarket valuation tool commonly used to measure preferences for protected agricultural lands. In this study, I focus explicitly on the ways that proximity to agricultural lands influences premiums for homes. To do this, I use residential sales data from Boulder County, Colorado to measure, in monetary terms, the amenity and dis-amenity impacts of living proximate to agricultural lands.

The next section presents a brief introduction to this study, followed by the framework for the study including an explanation of the theory underlying hedonic pricing models. After this I present a focused review of previous hedonic studies. Next, I describe the methods used in this study including a description of the data used. Then I present results from the analysis, followed by a discussion of the findings, limitations of the study, and comments about future directions for study.

INTRODUCTION

Conflict regarding agricultural land uses has risen in the past decades as nonfarm residents have migrated to exurban, rural areas (Centner 2002, Heimlich and Anderson 2001, Smith and Sharp 2005). Odor, noise, wastes, and other by-products associated with agricultural production systems have resulted in newcomers pursuing nuisance claims under common law (Centner 1986, Centner 2002). Often, community members seek redress based on claims that neighboring agricultural activities are limiting the quiet enjoyment of their properties. In other circumstances, individuals make claims that result in public policy debates (Georges 2009,

McVey and McVey 2009, Ready and Abdalla 2003). A key point of contentious claims often rests on concern about declines in residential property value (Ready and Abdalla 2005, Ready and Abdalla 2003).

According to economic theory the value for a good increases as one's utility for the good increases. In the context of agricultural lands, proximity and direct access to agricultural lands are ways that individual's utility of the lands increases. For instance, direct access to farmland increases an individual's utility by providing the opportunity for a variety of direct uses such as hiking, bird watching, or agritainment such as you-pick patches and corn mazes, or patronizing local farm stands (Sharp and Adua 2009). Horse-back riding along the edge of fields or running on a trail through a farm are other ways that agriculture supports recreation. Proximity to agricultural lands also influences one's utility for farmland and therefore is likely to influence farmland preferences. For example, in order to derive indirect uses such as aesthetic views one needs to be close enough to either see the farmland from their home or readily travel by or to it. On the other hand, proximity and access to agricultural lands can actually decrease one's utility when the activities associated with the agricultural lands are considered unwelcome.

The objective of this study is to estimate the economic impacts associated with being proximate to agricultural lands. A second objective is to relate these findings to questions from a general population survey (the subject of Chapter 5) about preferences for and perceptions about the impact of protected agricultural lands on the market price of their homes.

The motivation for this study was a public debate about the land uses on publicly protected agricultural lands in Boulder County, Colorado. In the debates, community members claimed that their house price would be negatively impacted by a more intensive agricultural production process on lands adjacent to their homes. Specifically, because of the contested

history of land use on protected agricultural lands in this study community, I relate findings from the hedonic model to survey results that measure the extent to which individuals are knowledgeable about the protection status of lands proximate to their homes, and respondent perceptions regarding protection of agricultural lands in general.

Hedonic Pricing Method Literature Review

The Theory behind Hedonic Valuation

Hedonic pricing models and geographic information systems are tools commonly used to value farmland amenities and identify the public's preferences for farmland protection (Bergstrom and Ready 2009). The hedonic price function $P(z)$, is an empirical relationship that predicts the market price of a house as a function of its attributes which can be characterized as a vector (z) (Rosen 1974). When used for the valuation of environmental nonmarket goods, hedonic theory most commonly relies on housing markets (Taylor 2003). The hedonic price function considers single family homes a collection of differentiated goods that vary (e.g., square footage, location, distance from town, scenic beauty) and that the market price of the house will depend on its levels of attributes. In a competitive market, houses with more attractive levels of attributes sell at higher prices. The model assumes perfect competition, and that house sales occur within a single market. Market interactions between producers and consumers determine market equilibrium: consumers search the available stock of houses and choose the house that maximizes their indirect utility function subject to their budget constraints. Equation (1) represents household i 's utility function:

$$(1) \quad u^i = U^i(x, z) \text{ s.t. } y^i = P(z) + x$$

Where x is a composite commodity representing all other goods and z is a vector of housing attributes and y is income. The hedonic price function that relates a home's sales price and its characteristics is represented in Equation (2).

$$(2) \quad P(z) = P(S, N, F)$$

Where S is a vector of structural housing characteristics, N is a vector of neighborhood characteristics, and F is a vector of farmland characteristics.

The first order condition for maximization is

$$(3) \quad \frac{\partial P}{\partial z_i} = \frac{\partial U / \partial z_i}{\partial U / \partial x}$$

In Equation (3) the left hand side represents the marginal implicit price of attribute z_i . The right hand side of the equation represents the household's rate of substitution between any characteristic, z_i , and money. In other words, for each additional unit of z_i , the marginal implicit price of z_i (left hand side of equation) measures the household's willingness to pay for each additional unit of z^i

In the context of this study, regressing the observed sales price of homes on all of the attributes of the home (including housing, neighborhood, and environmental characteristics) delivers the estimated marginal value of each attribute, or the price someone is willing to pay for one unit more of each attribute. In this study, z includes measures of proximity to farmland, access to farmland, and scenic beauty. In instances where the market is not at equilibrium, nonmarginal changes in z_i , the model cannot provide an exact measure of the cost and benefit of addition or subtractions of attributes. However, if the nonmarginal change from z^0 to z^1 is viewed as an improvement, the change can be interpreted as an upper bound for a household's willingness to pay for that exogenous change. Likewise, if the change between z^0 to z^1 is viewed

as a worsening, then the change represents a lower bound on the amount the household would need to be compensated to accept the change (Ready and Abdalla 2003).

Previous Hedonic Valuation Studies

Valuation of farmland amenities using the hedonic pricing method began in the 1990s (Bergstrom and Ready 2009) and the majority of studies have been within a broader context of the value of open space (Geoghegan, Wainger and Bockstael 1997, Geoghegan 2002, Irwin 2002, Irwin and Bockstael 2004). The primary concern of these studies has been on assessing whether different types of open space positively affect housing values. Generally, these studies have found that house prices increase with increases in the proportion of surrounding open space land that is protected from development (Irwin and Bockstael 2001, Irwin 2002).

Proximity to agricultural lands influences one's utility for farmland and therefore is likely to influence farmland preferences. Metz (2010) found that homes were positively and significantly impacted by being directly adjacent to any type of open space (defined as 30 feet from parcel edge) and that homes adjacent to protected land was valued three times more than similar homes adjacent to unprotected land. In the instance of intense production operations, proximity can also decrease one's utility for farmland. In Berks County Pennsylvania, Ready and Abdalla (2005) found a 4% decrease in home value when houses were located within a half mile from swine operations. In a study covering five counties in Iowa, Herriges et al.(2005) found a significant 16% decrease in homes within a quarter mile upwind of hog operations. Milla et al. (2005) found an impact of \$0.71 per pig 1 mile from the home. Kim and Goldsmith (2009) found a negative 8.2% impact on homes within a 1 mile radius of swine operations in Craven County, North Carolina. Some studies have found that the effect of distance to operations

decreases in a nonlinear fashion. Herriges et al. (2005) estimated 1.5 mile impacts to be 25% of those of the quarter mile impacts. Beyond concentrated livestock operations, one could imagine that being adjacent to farmland that had a lot of activity such as a farm stand that increased traffic, a trail head that had a large parking lot, or a farming operation that required a lot of farmworkers or mechanical equipment could also negatively influence the value of the farmland.

Direct access to farmland increases an individual's utility by providing the opportunity for a variety of direct uses. Previous farmland valuation studies suggest that some level of access is generally preferred but that trade-offs vary by the type of access and by the attitudes of the people using the preserved land (Duke and Aull-Hyde 2002, Johnston and Duke 2009, Kline and Wichelns 1998, Metz 2010). In a meta-regression of farmland choice experiments Johnston and Duke (2009) found that both moderate and high levels of access to farmland was preferred to farmland without access and moderate access was preferred two times more than high access. They defined moderate access as preserved lands that provide access for passive use and high access as public access for hunting and/or mechanized use on all land. In the context of protected coastal lands, McGonagle and Swallow (2005) found that respondent's utility were influenced by attitudes toward the environment, level of access and by their permanent place of residence and in general permanent coastal residents preferred low access levels over high access levels while non-permanent coastal residents generally preferred greater access. The authors also found that across both types of residents, those with pro-environmental attitudes generally preferred less access. A hedonic study including data spanning 5 counties by Metz (2010) found that protected open space with access had a higher value than open space without access and that adding 1 acre of protected land with access was one and a half times more valuable than the addition of 1 acre of protected land without access.

METHOD

Study Area and Data

The study area, Boulder County, Colorado is located on the Front Range of the Rocky Mountains, covers 742 square miles, and roughly 29% of the land is in agriculture. There are 746 farms in the county and the average farm size is 185 acres. Boulder County has an active conservation program that began in the 1970s. Through the County's Open Space Program, Boulder County has ownership of 25,154 acres of agricultural lands or approximately 25% of the county's agricultural lands. Additionally, the County has worked with landowners to conserve 19,164 acres of agricultural lands through conservation easements.

I used spatially referenced real estate data from Boulder County's Assessor's Office in this study. This dataset included a 2009 parcel map of Boulder County containing 121,864 parcels and individual parcel data such as sales date, sales price, lot size, and structural house characteristics. I estimated the hedonic model for single family residential parcels and therefore eliminated properties that were described as something other than single family residential in the Assessor's dataset. After requesting data sharing with the County they provided me with a spatial dataset that included all sales between the years 2000 and 2010. The initial file size was 117,946 observations. Because this data set contained sales ranging from vacant land sales to residential sales I selected only those records which were labeled single family residential. This resulted in a data set with 86,172 records. This list was further reduced to include only residential sales that had at least one bathroom and occurred in the following cities: Boulder, Lafayette, Longmont, Louisville, Lyons, Niwot, Superior, and Broomfield resulting in a dataset with 37,430 records. Nominal sales prices were adjusted to 2010 dollars. The mean sales price for homes was \$415,681. The summary statistics are provided in Table 6.1.

Table 6.1 Summary Statistics for Housing Characteristics				
Variable	Mean	Standard Deviation	Min	Max
Sales Price (2010 dollars)	415,681	265,913	2500	5,153,198
STRUCTURAL CHARACTERISTICS				
Parcel Size (sqft)	5,540	6,820	426	49,934
Age	23.6	22.7	0	139
Living Area (sqft)	1,812.6	840.2	240	10,301
Bedrooms	3.4	1.0	1	16
Baths	2.4	0.9	1	8.5
Basement	0.8	0.4	0	1
Garage	0.8	0.4	0	1
DISTANCE				
Distance nearest road (1000 ft)	1.13	0.9	0	7.2
Distance to Boulder (1000 ft)	41.1	24.4	0.2	88.5
Distance to trails (1000 ft)	8.3	5.2	0	49.6

I used GIS to construct a county-wide agricultural land-use map. Data for this map came from three sources. The private agricultural lands in the county were identified from the Boulder County Assessor's parcel dataset and included sales and deed transfers of properties going back to 1929. This file contained 3,305 parcels. After eliminating duplicates 2,582 parcels were used totaling 69,058 acres. An additional agricultural dataset was obtained from Boulder County's Parks and Open Space Program. This dataset contained 1,257 parcels of protected agricultural lands totaling 26,154 acres. In sum, the agricultural land use map captured 95,212 agricultural acres in the county. Based on the 2007 Census of Agriculture which reported 137,668 acres of land in farms in Boulder County, my map captures approximately 69% of the total agricultural land in the county. A 2008 presentation by Boulder County's Parks and Open Space Department reported 107,629 acres of farmland in the county, suggesting my map captures 88% of the total agricultural land in the county. A third dataset was acquired from the Boulder County Parks and Open Space Program consisting of the open space lands that had been protected in the County [See Map in Appendix X].

Measuring Proximity to Agricultural Lands

Buffer and distance variables were created using GIS to measure proximity to agricultural lands. Because I was interested in the impact of being directly adjacent to agricultural lands, I measured the Euclidean distance from parcel edge to parcel edge. Following Metz (2010) a property was considered adjacent to agricultural land if there was less than 30 feet between a residential property and the parcel of agricultural land. Because roads are minimally 32 feet; a 30 foot buffer helps prevent categorizing a home as being directly adjacent to agricultural lands if it is across the street (Metz 2010).

Circular buffers were also created at 30 feet and 2640 feet (1/4 mile), from the edge of each parcel in the analysis. The 30 foot buffer was chosen as a second measure of adjacency to ensure that the impacts of being directly adjacent to a parcel were being adequately captured. A ¼ mile distance represents the distance a resident might walk from their home while taking a walk (Ready and Abdalla 2005). Using GIS, the land type within each buffer was categorized as being private agricultural land, protected agricultural land, or as open space land. I constructed three variables from this for each buffer. *Private Agland* is a continuous variable that represents the square feet of private agricultural land within each buffer. The variable, *Protected Agland*, is a continuous variable that represents the total amount of protected agricultural land within the buffer. *Open Space* is a continuous variable representing the total square feet of open space lands within each buffer. These variables are mutually exclusive [See Table 6.2].

Each residential property was categorized as having access if they were within 30 foot of a parcel of open space with a trail (coded 1 = access, 0 = no access). Likewise, each property was categorized by protection status, based on whether or not they were directly adjacent to land that had been protected or not (1 = adjacent to protected lands, 0 = not adjacent to protected lands).

Table 6.2 Summary Statistics for Buffers

Buffer	Variable	Mean (Square Feet)	Standard Deviation	Min	Max
30 Foot	Open Space	95.46	735.44	0	22,390.95
	Protected Agland	59.25	1301.44	0	92,288.96
	Private Agland	68.90	1510.74	0	11,2049.30
Quarter Mile	Open Space	82,660.43	357,109.60	0	6,664,216
	Protected Agland	44,792.92	257,913.80	0	5,501,701
	Private Agland	114,985.50	406,599.70	0	5,958,801

Model Estimation

The implicit price function was estimated using ordinary least squares with the following form:

$$(4) \ln P_i = \beta_0 + \beta_1 S_i + \beta_2 N_2 + \beta_3 F_3 + \epsilon$$

Where S is a vector of structural housing characteristics, N is a vector of neighborhood characteristics, and F is a vector of farmland characteristics. The dependent variable is the natural log of the sales price. A log transformed dependent variable is used because housing prices vary greatly and log transformation of the dependent variable minimizes the possibility of heteroskedasticity (Cho et al. 2011). Other structural house characteristics included number of bathrooms and age of home. Dummy variables were created to control for presence of a basement. These variables are summarized in Table 6.1. Initially, I also created variables for number of bedrooms and garage but they did not add any explanatory power to the model. To account for the volatile housing market within the past ten years, dummy variables were included for the year of the sale, quarterly dummy variables were included to control for seasonal effects.

Home sales price can also be affected by a variety of neighborhood characteristics. To control for part of this variation across locations I control for elementary school and a group of distances from each residential property including distance: to the city of Boulder, major road, railroad, and open space trail. Using geographic information system (GIS) I linked GIS map

layers from Boulder County's Land Use Department detailing school districts, zoning and city boundaries to each residential property. To control for each school district, dummy variables were created. Euclidian distances were calculated using GIS maps from Boulder County's Land Use Department representing the distance to the nearest major road, railroad, and open space trail from the centroid of each parcel. [See Table 6.1]

RESULTS

I estimated several regressions to analyze the relationship between home price and proximity to agricultural lands. The results presented in Table 6.3 reflect the final specification of each model from the regressions run during analysis. In each regression I included dummy variables to control for the year of the sale, the season of the year when the sale took place, and elementary schools. For ease of presentation, these coefficients are not included in the tables. In testing the model specification, I found that all years were statistically different from each other. Likewise, the seasonal quarter dummies were also statistically different. The year 2001 was the reference category and compared to this year, models estimated negative coefficients for the sales years 2008, 2009, and 2010. Tests for multicollinearity indicated that there were no strong relationships among the independent variables used in the models.

Table 6.3 presents the results from two regressions modeling the impact of being proximate to agricultural lands. I modeled this at two different buffer distances from the edge of properties: 30 feet and a quarter mile. Across both models, the results for the control variables are consistent with expectations and findings from similar studies. The negative coefficient on age indicates that for every year older a house is, the market price decreases by 0.06%. As the square footage of the house increases, the market value increases. Likewise, the addition of a bathroom has a positive and significant impact on the sales price of the home.

Table 6.3 Hedonic Price Regression Results			
Outcome Variable: ln sale price	Units	Model 1 30 Foot Buffer b/p value	Model 2 Quarter Mile b/p value
Parcel size	Square feet	0.01270*** 0.00000	0.01275*** 0.00000
Age	Years	-0.00060*** 0.00017	-0.00056*** 0.00047
Ln living area	Square feet	0.42768*** 0.00000	0.42578*** 0.00000
Baths	Rooms	0.07724*** 0.00000	0.07753*** 0.00000
Distance to rail	Feet	0.00837*** 0.00000	0.00852*** 0.00000
Distance to roads	Feet	0.01888*** 0.01270***	0.01895*** 0.01275***
Total Open Space	Square feet	0.00002*** 0.00000	0.00000 0.10572
Total Protected Agland	Square feet	0.00001 0.0688	0.00000*** 0.00001
Total Private Agland	Square feet	-0.00003** 0.00813	0.00000 0.06983
Adjacent to Protected	1= yes 0 = no		0.06454*** 0.00002
Open Space * Protected Ag	Square feet	-0.00000*** 0.00004	0.00000 0.32825
Open Space * Private Ag	Square feet	0.00000*** 0.00000	0.00000 0.25313
Protected Ag * Private Ag	Square feet	0.00000*** 0.00000	-0.00000*** 0.00000
Open Space * Adjacent to Protected			0.00000 0.07031
Constant	Ln (2010 dollars)	9.64137*** 0.00000	9.64638*** 0.00000
N		37430	37430
R-squared		0.6572	0.6577

The main finding from these models is that while being proximate to agricultural lands impacts the price of homes, the significant impact comes from being adjacent to protected open

space lands or agricultural lands. Moreover, the impact from being proximate to agricultural lands is negative and significant, even when protection status is controlled for.

For instance, in Table 6.4, you can see that before controlling for agricultural lands or protection status of agricultural lands, there was a significant, slight positive impact associated with being proximate to open space lands within a 30 foot buffer (0.0002%). When agricultural lands are controlled for, the impact of increasing open space lands by one square foot remains the same, but the model also indicates that being that there is also a slight significant negative impact for being adjacent (within 30 foot buffer) to agricultural lands. Specifically, the interaction terms in Model 1c indicates that houses that are adjacent to both open space lands and protected adjacent lands are positively impacted as the square footage of open space lands increases (0.002%) but there is also a very slight, negative impact for each additional square foot of protected agricultural land. Moreover, Model 1d and Model 1e show that there is a negative and significant impact on the sales price of homes as each additional acre of private agricultural lands within a 30 foot buffer (-0.003%). This translates into \$0.46 decrease in sales price for each additional square foot of private agricultural land within 30 feet of the house edge.

The hedonic models that control for land within quarter mile buffers shows results similar to those found in the 30 foot buffer model. In Table 6.5 there is a very slight, significant, and positive impact (0.0000%) for each additional square foot of open space (Model 2b). Likewise, there is also a very slight, significant, and positive impact for each additional acre of protected agricultural land within the quarter mile buffer (Model 2c). When private agricultural lands is controlled, the interaction term indicates that there is only a significant, very slight, negative impact on sales price when it occurs in conjunction with protected agricultural lands (Model 2e).

More dramatically though, Model 2f, which controls for being directly adjacent to land that has been formally protected, shows that there is a significant, positive impact (6.5%) for being adjacent to protected lands.

Table 6.4 Hedonic Price Regression Results, 30 Foot Buffers

Outcome Variable: Insaleprice

	Model 1a	Model 1b	Model 1c	Model 1d	Model 1e
	b/p value	b/p value	b/p value	b/p value	b/p value
Parcel size (sqft)	0.01292***	0.01262***	0.01253***	0.01279***	0.01270***
	0.00000	0.00000	0.00000	0.00000	0.00000
Age (years)	-0.00062***	-0.00059***	-0.00059***	-0.00061***	-0.00060***
	0.00012	0.00022	0.00025	0.00015	0.00017
Ln living area (sqft)	0.42724***	0.42777***	0.42797***	0.42748***	0.42768***
	0.00000	0.00000	0.00000	0.00000	0.00000
Baths	0.07800***	0.07745***	0.07741***	0.07728***	0.07724***
	0.00000	0.00000	0.00000	0.00000	0.00000
Distance to rail (ft)	0.00809***	0.00843***	0.00846***	0.00835***	0.00837***
	0.00000	0.00000	0.00000	0.00000	0.00000
Distance to roads (ft)	0.01965***	0.01912***	0.01904***	0.01896***	0.01888***
Open Space		0.00002***	0.00002***	0.00002***	0.00002***
		0.00000	0.00000	0.00000	0.00000
Protected Ag			0.00002		0.00001
			0.0603		0.0688
Private Ag				-0.00003**	-0.00003**
				0.00767	0.00813
Open Space * Protected Ag			-0.00000***		-0.00000***
			0.00003		0.00004
Open Space * Private Ag				0.00000***	0.00000***
				0.00000	0.00000
Protected Ag * Private Ag					0.00000***
					0.00000
Constant	9.64965***	9.63899***	9.63802***	9.64233***	9.64137***
	0.00000	0.00000	0.00000	0.00000	0.00000
N	37430	37430	37430	37430	37430
R-squared	0.6565	0.6566	0.6567	0.6572	0.6572

All models have year, seasonal quarter, and elementary school dummy variables; they are not reported here to save space.

Table 6.5 Hedonic Price Regression Results, Quarter Mile Buffers
Outcome Variable: Insaleprice

	Model 2a	Model 2b	Model 2c	Model 2d	Model 2e	Model 2f
	b/p value	b/p value	b/p value	b/p value	b/p value	
Parcel size (sqft)	0.01292***	0.01289***	0.01279***	0.01292***	0.01292***	0.01275***
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Age (years)	-0.00062***	-0.00060***	-0.00059***	-0.00060***	-0.00057***	-0.00056***
	0.00012	0.00021	0.00025	0.00022	0.00038	0.00047
Ln living area (sqft)	0.42724***	0.42717***	0.42694***	0.42693***	0.42545***	0.42578***
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Baths	0.07800***	0.07813***	0.07833***	0.07811***	0.07831***	0.07753***
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Distance to rail (ft)	0.00809***	0.00802***	0.00807***	0.00804***	0.00826***	0.00852***
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Distance to roads (ft)	0.01965***	0.01927***	0.01912***	0.01919***	0.01945***	0.01895***
Open Space (sqft in ¼ mile)		0.00000***	0.00000***	0.00000***	0.00000***	0.00000
		0.00016	0.0006	0.00005	0.00031	0.10572
Protected Ag (sqft in ¼ mile)			0.00000*		0.00000***	0.00000***
			0.01499		0.00000	0.00001
Private Ag (sqft in ¼ mile)				0.00000	0.00000	0.00000
				0.99806	0.10327	0.06983
Adjacent to Protected land						0.06454***
						0.00002
Open Space * Protected Ag			0.00000		0.00000	0.00000
			0.9189		0.36943	0.32825
Open Space * Private Ag				0.00000	0.00000	0.00000
				0.09842	0.22075	0.25313
Protected Ag * Private Ag					-0.00000***	-0.00000***
					0.00000	0.00000
Open Space *Adj. Protected						0.00000
						0.07031
Constant	9.64965***	9.64678***	9.64853***	9.64778***	9.65345***	9.64638***
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
N	37430	37430	37430	37430	37430	37430
R-squared	0.6565	0.6566	0.6567	0.6566	0.6571	0.6577

All models have year, seasonal quarter, and elementary school dummy variables; they are not reported here to save space.

Table 6.6 provides the predicted values of sales prices and shows how they vary by protection status. The values were determined by setting the other coefficients to their means. If the coefficient of a variable of interest was insignificant, it was set to the zero to compute the predicted value. Table 6.6 makes evident that the real impact to home sales prices is derived from being directly adjacent to land that is protected.

Table 6.6 Predicted Sales Price, at means			
	(2010 dollars)	30 Foot Buffer	Quarter Mile
At means	Open Space = 0 Private Ag = 0 Protected Ag = 0	360,302	356,967 (Adjacent = 0) 432,440 (Adjacent = 1)
	Open Space = mean Private Ag = mean Protected Ag = 0	360,807	357,539 (Adjacent = 0) 433,132 (Adjacent = 1)
Controlling for directly adjacent to agland	Open Space = mean Private Ag = 0 Protected Ag = mean	360,374	358,111 (Adjacent = 0) 433,826 (Adjacent = 1)
	Open Space = 0 Private Ag = mean Protected Ag = mean	360,194	357,861 (Adjacent = 0) 433,522 (Adjacent = 1)

Survey Results

As noted earlier, the motivation for this study emerged from a public debate where community members claimed that their house price would be negatively impacted by a more intensive agricultural production process on lands adjacent to their homes. In this section I present results from these survey questions to consider in relation to results from the hedonic model. While the survey and hedonic model estimate different types of values for protected

agricultural lands, a discussion that considers results from both studies has the potential to provide a more nuanced understanding of the preferences for protected agricultural lands. Specifically, in the next section I present respondents' preferences for the protection level of farmlands closest to their property.

Protection Status and Market Value of Home

When asked how much they would like or dislike (1= dislike a lot, 5 = like a lot) the farmland closest to their home to have the different protection statuses (public ownership, conservation easement, or private ownership) 47% respondents indicated that they liked conservation easements a lot. Thirty-one percent of respondents indicated that they liked public ownership a lot and 24% liked private ownership a lot. Respondents were also asked what impact having different protection statuses (public ownership, conservation easement, private property) associated with the farmland closest to their home would have on the market value of the their property. Forty-eight percent of respondents stated that public ownership would have a positive impact, or a large positive impact on the market value of their property and 29% stated it would have no impact. Fifty-three percent of respondents stated that a conservation easement would have a positive or a large positive impact on the market value of their property and 28% stated it would have no impact. On the other hand, about 42% of respondents stated that if the farmland closest to their property was private property it would have no impact on the market value of their home. When asked whether proximity to farmland influenced their decision to purchase their property, 47% said it did not while 31% said it did, but that they were not concerned with the protection status of the farmland. Twenty-one percent of respondents' decision to purchase their home was influenced by the property's proximity to protected farmland [See Table 6.7].

Table 6.7 Preferences for Different Protection Statuses on Agricultural Lands Proximate to their Homes

How much would you like or dislike the farmland closest to your property to have the following protection statuses?	Dislike or Dislike a lot	Neutral	Like or Like a lot	I do not know
Public ownership	17%	23%	58%	2%
Conservation Easement	4%	19%	73%	4%
Private ownership	19%	33%	45%	3%
Think of the farmland closest to your property, how much impact, if any, do you think the following statuses would have on the property value of your home?	Negative or Large Negative Impact	No Impact	Positive or Large Positive Impact	I do not know
Public ownership	7%	29%	48%	17%
Conservation Easement	4%	28%	53%	16%
Private ownership	21%	42%	20%	17%

Knowledge about Distance to Nearest Agricultural Land

In the survey, respondents were asked to indicate on a measurement scale how far their property was to the nearest agricultural lands. Using paired t-tests, respondents' estimates were compared to the actual distance their property measure computed using GIS (for more information on this data see Chapter 5, methods section). Based on this measure, respondents indicated that they were on average 7,353 feet (approximately 1.4 miles) from the nearest agricultural lands. Based on the spatial dataset I created, respondents were on average 2,450 feet (approximately ½ mile) from the nearest agricultural land. On average, there was approximately a 4,902 feet difference between respondents' perceived distance to agricultural lands and the actual distance to the most proximate agricultural lands. Because open space lands are ubiquitous in Boulder County, and people often do not distinguish between open space and farmland, I also computed the average distance to the nearest open space land.

Table 6.8 Distance to Nearest Agricultural Lands					
Variable (units = feet)	N	Mean	Std. Dev.	Min	Max
Perceived distance to Agricultural land	189	7353.22	487.48	0	26,400
Actual distance to Agricultural land	197	2450.79	155.42	0	12,448
Actual distance to Open Space	197	3141	2528	0	12,025
Difference between actual and perceived distance to nearest agricultural land	189	5178	5850	0	25,743
Difference between actual and perceived distance to nearest open space land	189	5957	5833	40	25,997

DISCUSSION

The main finding from the hedonic pricing models is that being proximate to agricultural lands impacts the price of homes in a slight amount; however, the significant impact comes from being adjacent to protected open space lands or protected agricultural lands. The finding that protection status is what contributes most to the value of homes is consistent with other findings (Bergstrom and Ready 2009, Irwin 2002). Moreover, in this case study, this finding makes sense because of the large amount of open space lands in Boulder County; because open space is so prevalent, it is most likely already absorbed into the sales price of a house. Therefore, being adjacent to protected lands is where the significant impact comes from.

In the context of the public debate regarding proposed land use changes on the protected agricultural lands, the slight negative impact associated with being proximate to agricultural lands bolsters claims individuals made during the debates about the land uses on the agricultural lands adjacent to their property. There is a discernible, slight negative impact on home sales price as the amount of agricultural land increases within a 30 foot buffer. On the other hand the models also indicate that the negative impact is lessened when lands are protected. This suggests that residents have greater financial security in terms of the price of their home if their homes are

adjacent to lands that are protected. At the same time, the results from Model 2 (Quarter Mile Buffer) suggest that when we control for the amount of land within a larger area (a quarter mile rather than just 30 feet) there is not a significant difference between the impact of agricultural lands or open space lands. Rather, the thrust of the impact on home price is derived from the home being adjacent to lands that are protected. Thus, combined the results from Models 1 and 2 suggest that those individuals that are adjacent to agricultural lands, are on average impacted negatively by 0.003% (\$0.46 per sqft) for each additional acre of agricultural land within a 30 foot buffer of their home's property. This negative impact is reduced to 0.001% (\$0.15 per sqft) if the agricultural lands are protected. While these impacts may seem slight, Table 6.6 provides a more intuitive interpretation of the impacts.

Because this study was motivated from a practical debate, it is also interesting to examine the hedonic pricing estimates in relation to survey questions that measured perceptions about the impact of protected agricultural lands on the market price of their homes. In general, respondents indicated that they had preferences for the protection of agricultural lands most proximate to their home. When asked what impact the protection status had on the market price of their homes, almost half of respondents indicated that some sort of protection (public ownership, 48% or conservation easement, 53%) positively impacted the market price of their homes. So, we can say that approximately half of the survey respondents recognize the positive economic impacts protection has on the market price of their home. At the same time, 42% of respondents indicated that there was no impact from having private agricultural lands in close proximity to their homes. Finally, the survey data also indicate that on average, respondents misjudge the distance to the nearest agricultural lands by a mile.

This data also provides insights that may be useful for management. First, in terms of vocal complaints regarding land uses on protected agricultural lands, the findings in this study suggest that those individuals that own homes adjacent to agricultural lands have the most to lose, economically. In the context of protected agricultural lands, to avoid conflict, land management agencies might proactively seek out these residents to involve them in the land use planning process early on. At the same time, the finding that respondents, on average, misjudge the distance to the nearest agricultural lands suggests that management agencies may need to widen their net when proactively engaging citizens, i.e., citizens within at least a mile radius of a protected agricultural land may perceive a negative economic impact to the market value of their home.

LIMITATIONS

A couple of modeling issues arise when using hedonic models to estimate the effect of open space on residential home sales. First, endogeneity occurs if there is a housing characteristic that varies spatially and that influences the sales price of the home but is not observable (Irwin 2002). In this study, home sales price are endogenous to open space since the amount of open space in a neighborhood influences house prices; likewise house prices are likely to influence the amount of open space in a neighborhood. Ordinary least squares does not account for endogeneity and the issue of endogeneity was not controlled for in this analysis. Another limitation of this study is that it has not accounted or tested for any spatial dependencies. Spatial dependence refers to the relationship between what happens at two location separate locations (Taylor 2003). As a result, the standard errors of the coefficient estimates will be biased, however the coefficient estimates are not (Irwin 2002).

Also, estimates from hedonic models are also limited by the fact that they estimate a specific type of value for protected agricultural lands. Specifically, hedonic models only capture values that are discernable by individuals making choices about housing locations (Johnston et al. 2001). They do not fully account for the non-use values that individuals might have for farmlands or for non-property owners might have for agricultural lands (Irwin 2002). Despite these limitations, the study does provide evidence that are useful for policy-makers in the context of a local debate about land use.

CHAPTER VII

CONCLUSION

The purpose of this dissertation was to gain more knowledge about individuals' preferences for protected agricultural lands in two ways. First, this study sought to develop more knowledge about preferences for the *back end* of farmland protection, or those aspects that relate to the post-protection aspects of agricultural lands. The second goal of this study was to develop knowledge about the ways that preferences for protected agricultural lands are related to social and cultural factors. To address these goals, I relied on three different methodological approaches presented in earlier chapters. In this chapter I synthesize the findings from all three studies. After this, I discuss the implications of the findings for policy and research.

BACK END KNOWLEDGE

A major goal of this dissertation was to develop more knowledge about the *back end* aspects of farmland protection. Currently there is a preponderance of studies quantifying the magnitudes and determinants of support for farmland protection. Rarely, do studies place an emphasis on preferences for post-protection aspects of agricultural lands. However, agricultural lands are living systems with biological and ecological functions that are subject to the land use strategies employed by their managers. So even in instances when farmland has been protected in accordance with the public's stated preferences, the actual farmland management strategy employed might not deliver what the public expects. Farmland protection programs do alleviate the most obvious threat to the long-term viability of agriculture – the loss of farmland. However, less obvious threats to farmland viability include conflicts among farm and nonfarm rural

residents over what constitutes acceptable or compatible land use activities once the farmland has been protected (Sharp and Smith 2003).

Quantifying Preferences for the Post-Protection Aspects of Agricultural Lands

A primary question guiding and motivating this research endeavor involved determining whether, and to what extent, members of the general population are even concerned about issues related to protected agricultural lands, once they have been protected. Public debates about the management practices in Boulder County between the years 2008 and 2010 suggested that some segments of the general public did have preferences about the post-protection aspects of agricultural lands. In this dissertation, I addressed this question using a semi-structured, in-depth interviews with stakeholders, a general population survey, and a hedonic pricing model.

Findings from the qualitative inquiry confirm that a group of individuals, with a diversity of ties to the protected agricultural lands, are concerned about issues related to agricultural lands, post-protection. This finding is partly intuitive, given the fact that the study interviewed stakeholders, who by definition are invested in some way to the protected agricultural lands. This inquiry, however, helped to establish generally unrecognized aspects of the post-protection, or the *back-side* of farmland protection that stands to impact the extent to which individuals' preferences could be met. Specifically, this qualitative inquiry illuminated that stakeholders were concerned with the capacity of the County to manage the protected agricultural lands in ways that met stakeholder preferences.

At the same time, findings from the general population survey were less straightforward in terms of quantifying the extent to which respondents were concerned about post-protection aspects of agricultural lands. This was in part related to the nature of questions asked. As

described in the Limitations Section in Chapter 5, the survey instrument could have benefitted from the addition of a couple, simple, direct questions asking whether individuals are concerned about post-protection aspects of protected agricultural lands or whether they are interested in having a say in the management of agricultural lands once they have been protected. Thus quantifying this specific aspect at a broader level is limited.

On the other hand, the results from the hedonic pricing model, allows us to infer preferences for a broader set of individuals than just the stakeholders interviewed. Specifically, the hedonic model indicated that individuals whose houses are directly adjacent to protected agricultural lands stand to gain 6.5% in the sales price of their homes. From this, we can infer that homeowners within Boulder County would have an economic preference for living adjacent to agricultural lands that are protected.

Describing Preferences for the Post-Protection Aspects of Agricultural Lands

The studies in this dissertation also generated knowledge about the types of concerns individuals have regarding the *back end* of farmland protection. First, the qualitative inquiry revealed concerns about the processual aspects of farmland protection administration. Namely, stakeholders revealed concerns about how management plans for protected agricultural lands are negotiated, how land tenure relationships shape the management process, and about the property rights the public acquire when they support efforts to protect agricultural lands. In terms of a broader concern regarding the decision making process for the management plans, findings from the general population survey indicate that on average, farmers and agricultural experts should be the most involved in the management decisions on farmlands protected using public funds. Out of a possible of 5 points, with 5 reflecting a preference for the highest level of involvement,

farmers had a mean score of 4.52 and agricultural experts had a score of 3.85. In comparison, respondents indicated that county officials should have the least amount of involvement (2.89), the general public should have the next to the least amount (3.15), followed by individuals living adjacent to the protected agricultural lands (3.27). A possible explanation for the inconsistency between the stakeholders' concern and the general population concern could point to self-selection of the stakeholder group; i.e. by definition, the non-farmer stakeholders feel like they should have more say in the decision making process.

The stakeholder interviews also indicated strong concern about preferences to limit the types of agricultural land use practices allowed on the protected agricultural lands. However, data from the survey indicated that in general respondents are most interested in the non-market amenity benefits associated with agricultural lands. For instance, when respondents support efforts to protect agricultural lands they are more concerned with limiting development (70%) than with limiting the types of farmland practices on protected agricultural lands (28%). Moreover, many of the preferences expressed in the survey, suggest that many of these may not be dependent upon agricultural lands per se, but may be derived from open space lands as well. Specifically survey results indicated that respondents were more concerned about non-agricultural related activities when management plans for protected agricultural lands are created. These include: environmental aspects (82%); preservation for future generations (76%); rural character (76%); open space (75%); and scenic beauty (67%). Of the items selected, those ranked most important were: environmental aspects (ranked 1st), open space (ranked 2nd), re-localized food system (ranked 3rd), rural character (ranked 4th), and preservation for future generations (ranked 5th). Finally, the hedonic models provide evidence that protected agricultural lands are preferable to unprotected agricultural lands.

SOCIAL DIMENSIONS OF PREFERENCES

The second major goal of this dissertation was to relate individual preferences to social and cultural factors. This goal was motivated by the recognition that individuals develop value for lands in many ways; namely individuals develop positive emotional bonds, and thus value, to land through social and relational ties. However, this aspect is rarely accounted for in traditional farmland protection studies. At the same time, understanding the ways that individuals develop meanings and thus value for places through emotional connections offers a way to discover common ground around contested land use issues.

Relating Social and Cultural Ties to Preferences

A primary question guiding this part of my research asked whether individual preferences for protected agricultural lands are related to an individual's cultural and social ties. I addressed this question primarily through the general population survey (Chapter 5) and in-depth stakeholder interviews (Chapter 4). In the general population survey, the social factors that contributed significantly to an individual's preference to limit development when farmlands are protected were income and an individual's level of activity in rural recreational activities. Interestingly, the survey did not identify

A second way I addressed the social relational aspects of farmland protection was through in-depth interviews with stakeholders (Chapter 4). This study resulted in a nuanced understanding of the varied meanings individuals attach to farmland protection. Notably, some stakeholders understood their support of protection efforts as right to be involved more directly in the management practices happening on protected lands. At the same time, by forming lease relationships with former landowner-farmers with the tacit understanding that the landowner-

farmer could continue practicing agriculture the way they always had, the County implicitly ceded the rights of the citizens to participate in the land use decision making process.

Although the hedonic model is a quantitative approach used to understand the value individuals have for non-market goods, it also provides insight into reasons why and how social relational aspects within the institution of farmland protection may be influenced by economic incentives. Specifically, the hedonic model provides strong evidence that there are large economic gains to be made by homeowners living in close proximity to protected agricultural lands. Consequently, the ability to shape the economic value of a landscape places the agency in charge of the decisions regarding the protection of agricultural lands in a position of power. At the same time, as discussed earlier, the process through which these decisions are being made are often behind closed doors, while the costs of protecting lands is largely a public matter.

RESEARCH IMPLICATIONS

This dissertation contributes knowledge to the field of farmland protection by drawing attention to preferences individuals have for the *back-side* of farmland protection. Concerns identified by stakeholders about how management plans for protected agricultural lands are negotiated, how land tenure relationships shape the management process, and about the property rights the public acquire when they support efforts to protect agricultural lands, provide insights about aspects of farmland protection that are rarely addressed in the literature but do influence the outcomes associated with protection. At the same time, by using a political ecology framework to understand preferences for farmland protection, this study also draws explicit attention to the ways in which the social relationships mediating the protection of farmlands and subsequent management of farmlands are not apolitical, but are in fact shaped by different interest groups with a mix of intentions confronting each other to determine who has the rights to

use, regulate, or/and manage the protected lands. As a result, this study draws attention to areas where power mediates the outcomes associated with protected agricultural lands and subsequently influences whether individuals' preferences for farmland protection will be met. This study revealed that a major area where power was expressed was through the negotiations associated with leasing the protected agricultural lands out to farmers. Also, as noted earlier, the hedonic model also helps develop an understanding of the ways that power is held and utilized by the agency or individuals making decisions regarding which land will be protected.

This dissertation points to many directions for future research. First, efforts to protect agricultural lands began almost 40 years ago, and nationwide, voters overwhelmingly approve referenda to support protection efforts. This suggests that research agendas no longer need to emphasize what motivates individuals to protect efforts. Rather research efforts need to shift their gaze to understand what comes next; i.e. we've protected the farmlands, now what?

At the same time, there is the implicit assumption that once farmland is protected, the amenities generated by farmland will also be protected. Farmland protection programs do alleviate the most obvious threat to the long-term viability of agriculture – the loss of farmland. However, less obvious threats to farmland viability include conflicts among farm and nonfarm rural residents over what constitutes acceptable or compatible land use activities (Sharp and Smith 2003) once the farmland has been protected. And conflicts are likely to continue as more nonfarm individuals migrate to exurban areas.

The qualitative study in this dissertation also hints that segments of the public might value farmland protection as a tool to shape what they consider to be appropriate forms of agriculture. This begs larger questions of the institution of farmland protection. Primarily, what

goals are we trying to achieve from farmland protection? More broadly, this study suggests that when some individuals support farmland protection, they conceive of it as securing their right to participate in the decision making process tied to the lands that they are helping support. Again, this insight suggests questions for research. For instance: How prevalent is this sentiment? How does this sentiment vary as the protection tool changes (i.e. are stakeholders more likely to hold sentiment if the lands have been protected through fee-simple ownership?)? What social or geographic factors influence this sentiment?

Thinking of farmland protection through the lens of political ecology also suggests questions for future research. For instance, is Boulder County's experience with leasing back farmland it purchased outright from a landowner a common practice? If so, what are the ecological implications of such a model? Are there different ways (other than through the lease-back) in which power shapes the ecological outcomes associated with protected agricultural lands? For instance, in what ways does the institution of farmland protection influence broader ecological outcomes in a community and how are these outcomes related to the amount of power held by the land agency protecting the lands?

POLICY IMPLICATIONS

This research has particular importance for farmland preservation programs as well as policy makers involved in farmland protection efforts.

First, the qualitative inquiry provided insights into ways that a county government went about managing lands it had protected. However, as discussed in Chapter 4, some aspects of this plan caused conflict. Namely, the study illuminated how embedded social relationships among agency staff and landowner-farmers caused heightened concern about the County's overall capacity to manage the lands. A more transparent process would likely alleviate some conflict.

As a cautionary story, this study also provides insights into questions land trusts generally need to consider as they embark upon aggressive protection programs; namely what resources are needed to manage these lands in the long term, do we have the capacity to acquire these resources, and in what ways might our needs to acquire these resources compromise our ability to achieve our goals.

Second, in this study, respondents were most concerned with nonmarket amenities from agricultural lands that are not specific to agricultural lands (e.g., limiting development, environmental amenities). In order to maximize resources, land trusts need to identify the most efficient way to provide these goods, protecting farmland through fee-simple ownership may be unnecessary.

Third, given the negative impact associated with being proximate to agricultural lands, management agencies should take care to include these homeowners in discussions about land use changes. At the same time, results from the survey indicate that on average, respondents lack accuracy in their perceptions regarding the distance they are to protected agricultural lands. Thus, agencies need to broaden the net of homeowners they consider adjacent to agriculture.

SUMMARY

Overall, this study found that some individuals (stakeholders) have preferences for post-protection aspects of farmland protection. At the same time, respondents in the general population survey are most interested in the non-market amenity benefits often associated with agricultural lands. Moreover, many of the preferences expressed in the survey, suggest that many of the benefits may not require agricultural lands per se, but may be derived from open space lands as well. Similarly, the hedonic pricing model estimates provide evidence that the being

proximate to agricultural land that is protected and being proximate to open space land that is protected, are economically comparable. Combined, these findings suggest that the general public are most interested in farmland protection as a tool to curb development and manage growth rather than as a tool to shape agriculture. At the same time, the stakeholder interviews suggest that some individuals with a vested interest in the protected agricultural lands understand farmland protection as a tool to more directly shape the outcomes derived from the farmlands.

Conflicts about agricultural land uses are likely to continue as more ex-urbanites migrate to the rural countryside. At the same time, many land trusts have succeeded in protecting agricultural lands. Continuing to learn about what individuals want from these lands, once they have been protected is one aspect of alleviating conflicts over public lands.

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Appendix I: Recruitment to be Interviewed Script

The Perceived Costs and Benefits of Land Uses on Preserved Farmland in Boulder County, USA

Principal Investigator: **Amy Telligman**

TELEPHONE SCREEN

December 1, 2011, V1

PHONE/EMAIL SCRIPT:

“Hello, my name is Amy Telligman. I am a graduate student at the University of Colorado in the Environmental Studies Program. I am conducting a study about local food production, open space land and farmland in Boulder County. I am contacting you to see if you would like to participate in my study. The study consists of an in-person interview. During the interview I will ask you to discuss topics related to open space land, local food production and farmland in Boulder County. The interview will last approximately 1 hour and I am happy to meet you at a public location such as a coffee shop or library that is convenient to you. Does this sound like something that you would be interested in?”

TELEPHONE SCREENING SCRIPT

To see if you qualify to participate in the study I need to ask you a couple questions.

1. How long have you lived in Boulder County? _____	Less than 1 year = disqualified.
2. Would you describe yourself as belonging to any one of the following categories? If yes, which ones?	No=disqualified
a. Boulder County Board of Commissioners	
b. Employee of Boulder County Parks and Open Space Program	
c. Farmer renting land from Boulder County Parks and Open Space Program	
d. Boulder County Parks and Open Space Advisory Council	
e. Boulder County Food and Agriculture Policy Council	
f. Boulder County homeowner living within a 1 mile radius of Boulder County Parks and Open Space land	

Appendix II: Interview Guide

Boulder County Open Space:

My first questions have to do with Boulder County Open Space

A1. When you think of Open Space, why do we protect it? (PROBE: Can you describe what Open Space in Boulder County means to you? environmental protection, recreation, farming, growth control, etc.)

A2. Would you say that you are a proponent of Boulder County's Open Space Program? Why or why not?

From your perspective what are the advantages or attractive aspects of Boulder County Open Space?

Any potential disadvantages and drawbacks?

A3. Are there certain uses that you like more than others on the Open Space? Can you describe that more?

A4. Do you have feelings about what kinds of farming takes place on the open space? Can you describe that more?

A5. What role do you see Open Space playing in the County? (PROBE: environmental, recreation, farming, growth control)

A6. In what ways do you utilize Boulder County Open Space? How often?

A7. To what extent if any has Boulder County's Open Space factored into decisions regarding home purchases or living locations?

B. Local food production in Boulder County:

Now I'm going to ask you about your perspectives on local food production in general.

B1. Recently there has been a lot of talk about local food production, what does the phrase *local food production* mean to you?

B2. From your perspective what are the advantages or attractive aspects of local food production in general? (PROBES: environmental benefits, local economic development, social benefits, preservation of rural agricultural heritage, etc.)

B3. Any potential disadvantages and drawbacks? (PROBE: visibility and aesthetics, market considerations, water demands, impacts on habitats, political conflict, overstated claims of advocates)

B4. What would you estimate is the level of support for *local food production* in general in Boulder County? Is it seen as positive, negative, or are there people who simply don't have an opinion? (PROBE differences in views, and reasons for differences. Note comments on factions, divisions, areas of consensus among groups)

B5. What would you say is the level of support for *local food production* within your peer group? What does your peer group see as the primary advantages/disadvantages and attractive/unattractive aspects? (PROBE as above, and also for benefits to the county, state, region, such as jobs, economic development)

C. Perspectives on production of food on Boulder County Open Space

We just talked about your views and the views of your peers regarding local food production in Boulder County. Now I'd like to ask you a few questions about local food production on Boulder County Open Space farmland.

C1. Are you familiar with the discussions in the county about using Boulder County Open Space farmland for local food production? If yes, how have you learned about the discussions?

C2. What do you think about the proposal to use Boulder County Open Space farmland for food production? (PROBE for details about how it will impact them, issues that concern them/excite them, major barriers/ benefits)

C3. From the perspective of your peer group, what are/would be the most important considerations regarding food production on Boulder County Open Space farmland? (PROBE: economic feasibility, processing and distribution limitations, ecological limitations, aesthetics, ecological implications, etc.)

C4. Any potential disadvantages and drawbacks?

C4. What role do you think the community should play in creating land management policies for Boulder County Open Space in general? Should this differ by the type of Open Space land (e.g. farmland vs. recreation lands)?

C5. In general what role do you think government should play in food production?

D. Other Stakeholder Groups

D1. What other parties, organizations, or groups do you consider to be important stakeholders in decisions with respect to management of Boulder County's Open Space farmland? *(Be sure to get full names of organizations and individuals and information on where they are located, where they live, web sites, etc.)* If not familiar with the concept of stakeholder: The concept relates to parties that have defined themselves as having an interest in the outcome of some decision, or parties who believe they have something to gain or lose as a result of the decision-making process. Keep in mind that these stakeholders can be local, state, regional, or national and that they can be public, private, or non-profit.

D2. Have these stakeholders been engaged in discussions regarding management of Boulder County's Open Space farmland? If so, how? If not, why not? (PROBE for nature of engagement, intensity of engagement, reasons for engaging, not engaging.)

D3. Do you have a sense of where these different stakeholder groups stand on issues related to local food production on Boulder County Open Space farmland? (PROBE for where different groups stand, controversies and disagreements, coalitions)

D4. Do you have the sense that the different stakeholders are satisfied with the discussions and plans that have taken place concerning local food production on Boulder County Open Space farmland? Or that some are satisfied and some not? Can you describe the different positive and negative reactions you are aware of?

D5. What about the Boulder County residents in general? Do you have a sense of how they stand on local food production on Boulder County Open Space farmland?

D6. What sources should we consult to better understand different stakeholder positions on land management policies on Boulder County farmland?

Appendix III: Consent to Participate in Interview

UNIVERSITY OF COLORADO BOULDER CONSENT TO PARTICIPATE IN A RESEARCH STUDY

Study Title: The Perceived Costs and Benefits of Land Uses on Preserved Farmland in Boulder County, USA

Principal Investigator: Amy Telligman

Key Personnel: Nicholas Flores

Name	Role	Department	Phone Number	E-mail
Amy Telligman	Principal Investigator	Environmental Studies	303-735-5844	amy.telligman@colorado.edu
Nicholas Flores	Faculty Advisor	Economics	303-492-8145	floresn@stripe.colorado.edu

Your participation in this research study is voluntary. Please think about the information below carefully. Feel free to ask questions before making your decision whether or not to participate. If you decide to participate, you will be asked to sign this form and will receive a copy of the form.

Purpose and Background

This research study is about farmland, food production and open space. The study aims to learn what Boulder County residents think about each of these items. Information learned in this study will help policy makers create land use policies that are sensitive to a community's needs and wishes. You are being asked to be in this study because you are a resident of Boulder County with an opinion on farmland, food production, and open space. It is entirely your choice whether or not to participate in this study. Sixty participants will be invited to participate in this research study.

Study Tasks and Procedures

If you agree to take part in this study, you will be asked to sign this consent form before we ask any study questions.

Next, if you agree to participate in the study I will ask you to respond to interview questions. You will be asked questions about farmland, food production and open space in Boulder County.

Participation in this research may include audio taping. These tapes will be used to record the information that you share and will later be transcribed and used in research. The tapes will be retained for 1 year. Individuals who will have access to these tapes will include me, my faculty advisor, and the person that

transcribes the audio recording into a written record. Being audio taped is not a requirement for participation. You may still participate in the study should you choose not be taped.

Duration

Participating should take about 1 hour of your time.

Study Withdrawal

You are able to withdrawal from this study at any time – even if we have begun asking you questions.

Risks and Discomforts

There are no foreseeable risks associated with this study.

Benefits

There are no direct benefits to you for taking part in this study. This study will benefit society by gaining a better understanding of individuals understanding of food production, farmland and open space.

Confidentiality

The information in this study will only be used in ways that will not reveal who you are. You will not be identified in any publication from this study or in any data files shared with other researchers.

During this research, we will collect information about you. We will store the information according to a random code. We will have a key that matches the code to your name. The key will be kept separately from the information about you. That way, only people who have the key will be able to connect the information we collect about you with your name and identity.

We will keep all paper records, like the key and this form, in a locked filing cabinet in a locked office.

These are some reasons that we may need to share the information you give us with others:

- If it is required by law.
- If we think you or someone else could be harmed.
- Sponsors, government agencies or research staffs sometimes look at forms like this and other study records. They do this to make sure the research is done safely and legally. Organizations that may look at study records include:
 - i. Office for Human Research Protections or other federal, state, or international regulatory agencies
 - ii. The University of Colorado Boulder Institutional Review Board

Incentives

You will not be paid for participation in this study.

Participant Rights

Taking part in this study is your choice. You may choose either to take part or not take part in the study. If you decide to take part in this study, you may leave the study at any time. No matter what decision you make, there will be no penalty to you in any way. You will not lose any of your regular benefits. We will tell you if we learn any new information that could change your mind about being in this research study. For example, we will tell you about information that could affect your health or well-being.

If you are injured

If you feel that you may have been harmed while participating in this study, you should inform Amy Telligman immediately. The cost for any treatment will be billed to you or your medical or hospital insurance. The University of Colorado at Boulder has no funds set aside for the payment of health care expenses for this study. If you should find the need to make an injury claim, Colorado State Law allows for claims to be made within 180 days of the discovery of injury (Article 24-10-109).

Contacts and Questions

For questions, concerns, or complaints about this study, call Amy Telligman at (303) 735-5844.
If you are injured as a result of participating in this study or for questions about a study-related injury, call Amy Telligman at (303) 735-5844.
If you have questions about your rights as a research study participant, you can call the Institutional Review Board (IRB). The IRB is independent from the research team. You can contact the IRB if you have concerns or complaints that you do not want to talk to the study team about. The IRB phone number is (303) 735-3702.

Signing the Consent Form

AUDIO RECORDING

This study includes audio taping. These tapes will be used as data in my study. I will transcribe the data into a written document and then use them as data in my research study. They will be kept until the data is transcribed to a written document. The people who will be able to hear the recordings include myself and my advisor.

You do not have to agree to be recorded in order to participate in the study.

Initial one:

_____ I agree to be audio taped while taking part in this research study.

_____ I do not agree to be audio taped while taking part in this research study

I have read (or someone has read to me) this form. I am aware that I am being asked to be in a research study. I have had a chance to ask all the questions I have at this time. I have had my questions answered in a way that is clear. I voluntarily agree to be in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form.

Name of Participant (printed) _____

Signature of Participant _____ Date _____

Name of Person Obtaining Consent (printed) _____

Signature of Person Obtaining Consent _____ Date _____

Appendix IV: Letter of Invitation to Participate in Survey



Institute of Behavioral Science
Environment and Society Program
Campus Box 483
Boulder, Colorado 80309-0483

Office: (303) 735- 5844
Cell: (720) 252-5433
amy.telligman@colorado.edu

Dear Boulder County Resident:

I am writing to ask you to participate in a study I am conducting that explores how people feel about farmland practices in Boulder County. You were randomly selected from Boulder County addresses. Through my study I want to learn about people's experiences living in a community with agricultural lands nearby. I am especially interested in how people feel about farmland practices on land that is owned or managed by Boulder County or cities in Boulder County.

To participate, all you need to do is either fill out a survey that can be accessed over the Internet or you can send back the postage-paid card to request a printed version of the survey. If you choose to receive a printed survey, I will send you a postage-paid envelope to return your completed survey. Your participation is important for the study because all views need to be represented. If you choose to participate, all of your answers will be completely confidential. This survey is completely voluntary.

I am especially interested in people that are **permanent residents of Boulder County** and who **own their home**. If you fit this description, you can help us by taking a few minutes to share your experiences and opinions about living in Boulder County. We know your time is valuable so we really appreciate your participation!

Do you qualify for this study?

1. Are you a permanent resident of Boulder County?
2. Are you 18 years of age or older?
3. Do you own your home?

If you answered **YES** to all of the questions listed above and would like to participate in our study follow the directions at the bottom of this letter.

If you have any questions about this study, please feel free to call me at 303-735-5844, or you can write me directly at amy.telligman@colorado.edu.

Sincerely,

Amy Telligman

You can find the **Farmland Preference Survey** at: <http://www.colorado.edu/ibs/farmlandsurvey>

Once on the webpage, you will be prompted to enter the **5-digit pin number** _____.

Appendix V: Postcard Reminder, Recruitment to Participate in Survey

May 30, 2013

Last month you should have received a request from me to complete a survey about farmland practices. It was sent to your address as part of our effort to learn what farmland practices people like and dislike. The information you provide is very important to the accuracy and success of the survey.

If you have already completed the survey, please accept my sincere thanks. If you have not yet had time to complete the survey, please do so as soon as possible. I understand your time is valuable and would be grateful for the 20 minutes anticipated to complete the survey.

You can access the survey at www.colorado.edu/ibs/farmlandsurvey. To access the survey from the website you will need to enter the **5-digit pin number**

If you would like a paper copy of the survey or have any questions about the survey, please call Amy Telligman at 303-735-5844 or email at amy.telligman@colorado.edu. I will be happy to talk to you.

Sincerely,

Amy Telligman

Side 2



University of Colorado
Boulder

Institute of Behavioral Science
University of Colorado
UCB 483
Boulder CO 80309

Attention: Amy Telligman

Appendix VI: Postcard Reminder, Recruitment to Participate in Survey

Farmland Practices Study

It's not too late! A couple weeks ago we invited you to participate in a study about farmland practices in Boulder County. Your participation is important for the study because all views need to be represented.

If you have already completed the survey, please accept my sincere thanks. If you have not yet had time to complete the survey, please do so as soon as possible. Your participation is important for the study because all views need to be represented.

You can access the survey at ***www.colorado.edu/ibs/farmlandsurvey***.

To access the survey from the website enter the **5-digit pin number** _____.

If you would like a printed version of the survey or have any questions about the survey, please call Amy Telligman at 303-735-5844 or email at amy.telligman@colorado.edu. I will be happy to talk to you.

Sincerely,

Amy Telligman

SIDE 2



University of Colorado
Boulder

Institute of Behavioral Science
Environment and Society Program
Campus Box 483
Boulder, Colorado 80309-0483

Attention: Amy Telligman

Appendix VII: Final Letter of Recruitment to Participate in Survey



Institute of Behavioral Science
Environment and Society Program
Campus Box 483
Boulder, Colorado 80309-0483

Office: (303) 735- 5844
Cell: (720) 252-5433
amy.telligman@colorado.edu

June 15, 2013

Dear Boulder County Resident:

You may recall that a few weeks ago we asked you to help in a study about farmland practices. We mailed this request only to a small representative sample of Boulder County residents. Nearly a third of those who received the request have completed the survey. A few others wrote to us indicating that they did not have time or did not want to participate in the study. We have become concerned that people, such as you, who did not complete the survey, may have different opinions about farmland practices than those who did reply. Consequently, we are making this final contact in the hopes that you might share some of your thoughts with us. Access the survey at www.colorado.edu/ibs/farmlandsurvey.

You will be asked to enter your **5-digit pin number** _____.

If you prefer a paper survey, or if you have any questions about this study, please feel free to call Amy Telligman at 303-735-5844, or you can write me directly at amy.telligman@colorado.edu.

I realize your time is valuable and appreciate your taking time to fill out the survey. Thank you very much for helping with this important study.

Sincerely,

Amy Telligman

PhD Candidate, Environmental Studies Program

You can find the **Farmland Preference Survey** at: <http://www.colorado.edu/ibs/farmlandsurvey>

Once on the webpage, you will be prompted to enter the **5-digit pin number** _____.

Appendix VIII: Consent to Participate in Survey



CONSENT TO PARTICIPATE IN A RESEARCH STUDY

Study Title: Farmland Preference Survey

Principal Investigator: Amy Telligman

Key Personnel: Nicholas E. Flores

Your participation in this research study is voluntary. Please think about the information below carefully. Feel free to ask questions before making your decision whether or not to participate. If you decide to participate, you will be asked to sign this form and will receive a copy of the form.

Purpose and Background

This research study aims to learn what Boulder County residents think about different farmland practices. Information learned in this study will help policy makers create land use policies that are sensitive to a community's needs and wishes. You are being asked to be in this study because you are a resident of Boulder County with an opinion on farmland. It is entirely your choice whether or not to participate in this study.

Study Tasks and Procedures

If you agree to take part in this study, you will be asked to sign this consent form before we ask any study questions. Once you have signed this, please locate your paper survey included in the same envelope that this paper arrived in. Complete the survey and return it and this consent form in the self-addressed stamped envelope provided in the mailing.

Duration

Participating should take about 20 minutes of your time.

Study Withdrawal

You are able to withdrawal from this study at any time – even if we you have begun answering questions.

Risks and Discomforts

There are no foreseeable risks associated with this study.

Benefits

There are no direct benefits to you for taking part in this study. This study will benefit society by gaining a better understanding of individuals understanding of food production, farmland and open space.

Confidentiality

These are some reasons that we may need to share the information you give us with others:

- If it is required by law.
- If we think you or someone else could be harmed.

- Sponsors, government agencies or research staff sometimes look at forms like this and other study records. They do this to make sure the research is done safely and legally. Organizations that may look at study records include:
Office for Human Research Protections or other federal, state, or international regulatory agencies
The University of Colorado Boulder Institutional Review Board
The sponsor or agency supporting the study: Environmental Studies Program, University of Colorado.

Compensation

You will not be paid for participation in this study.

Participant Rights

Taking part in this study is your choice. You may choose either to take part or not take part in the study. If you decide to take part in this study, you may leave the study at any time. No matter what decision you make, there will be no penalty to you in any way. You will not lose any of your regular benefits. We will tell you if we learn any new information that could change your mind about being in this research study. For example, we will tell you about information that could affect your health or well-being.

Contacts and Questions

Name	Role	Department	Phone Number	E-mail
Amy Telligman	Principal Investigator	ENVS	303-735-5844	Amy.telligman@colorado.edu
Nicholas E. Flores	Advisor	ECON	303-492-8145	floresn@stripe.colorado.edu

For questions, concerns, or complaints about this study, call Amy Telligman at (303) 735-5844.

If you have questions about your rights as a research study participant, you can call the Institutional Review Board (IRB). The IRB is independent from the research team. You can contact the IRB if you have concerns or complaints that you do not want to talk to the study team about. The IRB phone number is (303) 735-3702.

Appendix IX: Survey



University of Colorado
Boulder

Amy Lee Telligman
amy.telligman@colorado.edu

SECTION 1: INTRODUCTION

In this study I want to learn about your experience with agricultural land near you and more widely in Boulder County. I am especially interested in how you feel about farmland practices on land that is owned or managed by Boulder County or cities in Boulder County.

1. Which statement best describes how you think about farmland:

- ☐ I always think of farmland and open space as the same thing.
- ☐ I never think of farmland and open space as the same thing.
- ☐ I am inconsistent with the way I think about farmland and open space.
- ☐ Other, please explain below. _____

2. Please use the space below to include additional comments.

SECTION 2: DISTANCE TO FARMLAND

Throughout the rest of the survey when we ask you questions about **farmlands** and **farming** we use the term farmland to mean land that is used for agricultural purposes. Farmland might include cropland, grazing land or pasture, and orchards. In addition, farmland may include structures such as farm houses, barns, and greenhouses. Some farmland can also be used for commercial purposes such as roadside stands. Farmlands can also be sources of open space. We will also ask you questions about your property. We use the word property to refer to your place of permanent residence.

3. Can you see farmland from anywhere on your property?

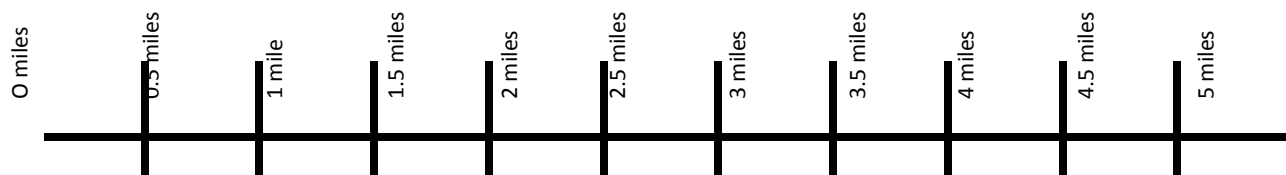
- ☐ Yes
- ☐ No

4. How long would it take you to walk to the nearest farmland from your property (either on road, formal trail, or some other path)?

- ☐ Less than 5 minutes
- ☐ 5 to 15 minutes
- ☐ 16 to 30 minutes

- ☐ More than 30 minutes
- ☐ I do not know → **If you do not know, skip to SECTION 3 on next page**

5. Using the scale below, place an **X** at the approximate distance (in miles) your property is to the nearest farmland (either on road, formal trail, or some other path).



SECTION 3: ATTACHMENT TO FARMLAND

Throughout the survey you will be asked to answer questions using a scale like the one below. When you answer your questions, we ask that you use the scale to indicate your level of like/dislike. We also ask that you maintain the same definition for the terms *like* and *dislike* throughout the question so that when we report your score, we know that if you dislike dogs a lot and you dislike cats a lot, you dislike them to the same degree.

	Dislike A lot	Dislike	Neutral	Like	Like A lot	I do not know
dogs	☐	☐	☐	☐	☐	☐
cats	☐	☐	☐	☐	☐	☐

6. How much do you agree or disagree with the following statements about farmland?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
When I spend time in or around farmland (walking, driving by, viewing from home, etc.) I have a sense of oneness with the natural environment.	☐	☐	☐	☐	☐
I am attached to the natural environment provided by the farmland in Boulder County.	☐	☐	☐	☐	☐
Recreating in and around the farmland in Boulder County is very important to me.	☐	☐	☐	☐	☐

7. How much do you agree or disagree with the following statements about farmland?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I would feel less attached to my community if there was less farmland.	☐	☐	☐	☐	☐
Belonging to groups associated with farmland in Boulder County is very important to me.	☐	☐	☐	☐	☐
Interacting with the farming community in Boulder County is very important to me.	☐	☐	☐	☐	☐
I am attached to the farmland in Boulder County.	☐	☐	☐	☐	☐

Please use the space below to include additional comments.

SECTION 4: FARMLAND PROTECTION

In this study we use the terms related to farmland and farmland protection in the ways described below.

- **Private ownership** refers to farmland owned by an individual. Farmland that has not been formally protected may or may not be developed in the future.
- **Protected farmland** refers to farmland that is protected from future development. Farmland can be protected through state and local governments or private organizations.

Generally the land is protected in either of two ways: (1) public ownership, or (2) conservation easement.

(1) **Public ownership** refers to protected farmland that is owned by a state or local government. The management of the farmland is the responsibility of the state or local government that owns the property.

(2) **Conservation easement** refers to protected farmland that is privately owned by an individual. The management of the farmland remains the responsibility of the individual; however the owner has sold off most or all of the development rights to the farmland and has legally committed to maintaining the farmland in some form of agriculture.

8. How much would you *like* or *dislike* the farmland closest to your property to have the following protection statuses?

	Dislike A lot	Dislike	Neutral	Like	Like A lot	I do not know
Public ownership	☐	☐	☐	☐	☐	☐
Conservation easement	☐	☐	☐	☐	☐	☐
Private ownership	☐	☐	☐	☐	☐	☐

9. Think of the farmland closest to your property. How much impact, if any, do you think the following statuses of farmland could have on the market value of your property?

	Large Negative Impact		No Impact		Large Positive Impact	I do not know
Public Ownership	☐	☐	☐	☐	☐	☐
Conservation Easement	☐	☐	☐	☐	☐	☐
Private Ownership	☐	☐	☐	☐	☐	☐

10. Are you aware that some farmland in Boulder County is protected?

- ☐ Yes
- ☐ No → **If NO is selected, skip to SECTION 5 ON PAGE 8**
- ☐ Add any comments in the box below _____

11. How long have you known about protected farmland in Boulder County?

- ☐ Less than 5 years
- ☐ More than 5 years
- ☐ I do not know

Answer these questions if you answered YES to Question 10.

If you answered NO to Question 10, skip to Section 5 on page 8.

13. Which statement describes the protection status of the farmland closest to your property? **(Check all that apply)**

- ☐ Publicly owned
- ☐ Privately owned
- ☐ Conservation easement
- ☐ I do not know

14. Did any of the following contribute to your decision to rent or buy your current property? **(Check all that apply)**

- ☐ Proximity to protected farmland
- ☐ Proximity to private farmland
- ☐ Proximity to farmland in general, but I was not concerned with the protection status of the surrounding farmland
- ☐ Proximity to farmland did not influence my decision
- ☐ I do not know

15. In general, do you think that farmland needs to be protected?

- ☐ Yes
- ☐ No
- ☐ I do not know

16. How much do you agree or disagree with the following statements about the role of government in farmland protection?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Government should compensate farmers for the nontraditional benefits produced by agriculture (e.g. open space, wildlife habitat).	☐	☐	☐	☐	☐
Steps should be taken by government to protect farmlands that provide nontraditional benefits (e.g. open space, wildlife habitat) to communities.	☐	☐	☐	☐	☐

17. Have you ever supported efforts to protect farmland (for example, supported open space ballot initiatives)?

- ☐ Yes
- ☐ No
- ☐ I do not know

Add any comments here:

SECTION 5: FARMLAND MANAGEMENT

18. What benefits, if any, do you believe farmland brings to your county? **(Check all that apply)**

- ☐ Crop production
- ☐ Rural Character
- ☐ Environmental benefits such as wildlife habitat or pollination
- ☐ Open Space
- ☐ Jobs for the farming community
- ☐ Protection against urban sprawl
- ☐ Food security
- ☐ Recreational opportunities
- ☐ Community relationships
- ☐ Agricultural heritage
- ☐ Scenic beauty
- ☐ Attractiveness to visitors
- ☐ Re-localized food system (more local control with better access to local foods)
- ☐ Other _____
- ☐ None, I do not believe farmland benefits my county

19. If public funds are used to protect farmlands in your county, what level of involvement do you think each of the following stakeholders should have in the decisions about how the protected farmlands are managed?

	None		Some		A lot	No opinion
Farmer	☐	☐	☐	☐	☐	☐
General Public	☐	☐	☐	☐	☐	☐
Agency Protecting the Farmland (land trust, county/city government, etc.)	☐	☐	☐	☐	☐	☐
Elected County Officials	☐	☐	☐	☐	☐	☐
Agricultural Experts (crop consultants, university extension agents, etc.)	☐	☐	☐	☐	☐	☐
People Living Adjacent to the Farmland	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐

Add any comments here:

20. Once farmlands are protected they have to be managed. When creating management plans for protected farmlands, which of the following aspects are important to you? **(Check all that apply)**

- ☐ Rural Character
- ☐ Crop production levels
- ☐ Economic factors associated with farming
- ☐ Environmental aspects (biodiversity, wildlife habitat)
- ☐ Open Space
- ☐ Jobs for the farming community
- ☐ Food security
- ☐ Recreational opportunities
- ☐ Community relationships
- ☐ Agricultural heritage
- ☐ Re-localized food system (more local control with better access to local foods)
- ☐ Preservation for future generations
- ☐ Attractiveness to visitors
- ☐ Ability for the public to participate in the management plan
- ☐ Scenic beauty
- ☐ Other _____
- ☐ None, I do not believe any of the items listed above are important to consider when creating management plans

If None, Skip to SECTION 7 on page 27.

21. Of the aspects of farmland you consider important in farmland management plans (that you checked in Question 20), which is the most and least important? Rank the items below starting with 1 for most important. Only rank those items that you indicated were important in Question 20. (Zero is not a valid answer)

- ____ Rural Character
- ____ Crop production levels
- ____ Economic factors associated with farming
- ____ Environmental aspects (biodiversity, wildlife habitat)
- ____ Open Space
- ____ Jobs for the farming community
- ____ Food security
- ____ Recreational opportunities
- ____ Community relationships
- ____ Agricultural heritage
- ____ Re-localized food system (more local control with better access to local foods)
- ____ Preservation for future generations
- ____ Attractiveness to visitors
- ____ Ability for the public to participate in the management plan
- ____ Scenic beauty
- ____ Other _____
- ____ None, I do not believe any of the items listed above are important to consider when creating management plans.

SECTION 6: FARMLAND PREFERENCES

In Question 21 we asked you to rank the items you consider most important in the creation of management plans for protected farmlands. We are interested in learning what factors, if any, influenced how you ranked the items in Question 21. Specifically, we want to know what, if anything, influenced the item you ranked the most important (number 1).

Use the list below to see which page in the survey to proceed to next by locating the item that you ranked as the most important in Question 21.

MOST IMPORTANT ITEM (Rank of 1)	Turn to page:
Rural Character	Page 12
Crop Production Levels	Page 13
Economic factors associated with farming	Page 13
Ability for public to participate	Page 14
Environmental Aspects	Page 15
Open Space	Page 16
Jobs	Page 17
Food Security	Page 18
Recreational opportunities	Page 19
Community relationships	Page 20
Agricultural heritage	Page 21
Re-localized food system	Page 22
Preservation for future generations	Page 23
Attractiveness to visitors	Page 24
Scenic beauty	Page 25
Other	Page 26
None	Page 27

RURAL CHARACTER

Only complete these questions if you ranked ***Rural Character*** as the most important consideration in managing protected farmland.

How much, if any, did the following items influence your decision to rank ***Rural Character*** as the most important consideration in managing protected farmlands?

	Not at all (1)	(2)	Some (3)	(4)	A lot (5)
Scenic beauty	☐	☐	☐	☐	☐
Contrast of farmlands with mountains/urban development	☐	☐	☐	☐	☐
Farm house, barn, or other buildings dotting the landscape	☐	☐	☐	☐	☐
Farm animals and equipment dotting the landscape	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐

If you would like to include additional comments regarding the importance of Rural Character in the management of farmland, please describe them below.

When these questions are complete, skip to SECTION 7 on page 27.

ECONOMICS of FARMING

Only complete these questions if you ranked *Economics of Farming* as the most important consideration in managing protected farmland.

How much, if any, did your concern about the following items influence your decision to rank *Economics of Farming* as the most important consideration in managing farmlands?

	None		Some		A lot
Demand for crops	☐	☐	☐	☐	☐
Availability of water	☐	☐	☐	☐	☐
Infrastructure needs (grain storage, processing, etc.)	☐	☐	☐	☐	☐
Access to markets	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐

If you would like to include additional comments regarding the importance of the *Economics Associated with Farming* in the management of protected farmlands, please describe them below.

When these questions are complete, skip to SECTION 7 on page 27.

ABILITY TO PARTICIPATE

Only complete these questions if you ranked **Ability to Participate** as the most important consideration in managing protected farmland.

How much, if any, did your concern for the following items influence your decision to rank **Ability to Participate** as the most important consideration in managing farmlands?

	None		Some		A lot
Belief in democracy	☐	☐	☐	☐	☐
Desire to contribute to farmland management plan	☐	☐	☐	☐	☐
Farming practices in the county	☐	☐	☐	☐	☐
Farming practices in the U.S.	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐

If you would like to include additional comments regarding the importance of the **Ability of the Public to Participate** in the management of protected farmlands, please describe below.

When these questions are complete, skip to SECTION 7 on page 27.

ENVIRONMENTAL ASPECTS

Only complete these questions if you ranked *Environmental Aspects* as the most important consideration in managing protected farmland.

How much, if any, did your concern about the following items influence your decision to rank *Environmental Aspects* as the most important consideration in managing protected farmlands?

	Not at all		Some		A lot
Nutrient/pesticide runoff	☐	☐	☐	☐	☐
Biodiversity	☐	☐	☐	☐	☐
Use of genetically modified seeds	☐	☐	☐	☐	☐
Native plant habitat	☐	☐	☐	☐	☐
Wildlife habitat	☐	☐	☐	☐	☐
Water resources	☐	☐	☐	☐	☐
Climate Change	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐

If you would like to include additional comments regarding the importance of *Environmental Aspects* in the management of protected farmland, please describe below.

When these questions are complete, skip to SECTION 7 on page 27.

OPEN SPACE

Only complete these questions if you ranked ***Open Space*** as the most important consideration in managing protected farmland.

How much, if any, did your concern for the following items influence your decision to rank ***Open Space*** as the most important consideration in managing protected farmlands?

	Not at all		Some		A lot
Scenic beauty	☐	☐	☐	☐	☐
Open Space	☐	☐	☐	☐	☐
Protection against sprawl	☐	☐	☐	☐	☐
Buffer between cities	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐

If you would like to include additional comments regarding the importance of ***Open Space*** in the management of protected farmland, please describe below.

When these questions are complete, skip to SECTION 7 on page 27.

JOBS

Only complete these questions if you ranked **Jobs** as the most important consideration in managing protected farmland.

How much, if any, did your concern for the following items influence your decision to rank **Jobs** as the most important consideration in managing protected farmlands?

	Not at all		Some		A lot
Jobs for farmers and farm workers	☐	☐	☐	☐	☐
Working conditions for farmers	☐	☐	☐	☐	☐
Working conditions for farm workers	☐	☐	☐	☐	☐
Diversity of farming communities	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐

If you would like to include additional comments regarding the importance of **Jobs** in the management of protected farmlands, please describe below.

When these questions are complete, skip to SECTION 7 on page 27.

FOOD SECURITY

Only complete these questions if you ranked **Food Security** as the most important consideration in managing protected farmland.

How much, if any, did your concern for the following items influence your decision to rank **Food Security** as the most important consideration in managing protected farmlands?

	Not at all		Some		None
Locally produced foods	☐	☐	☐	☐	☐
Food shortages	☐	☐	☐	☐	☐
Food safety	☐	☐	☐	☐	☐
Food prices	☐	☐	☐	☐	☐
People lack adequate food (food insecure people and communities)	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐

If you would like to include additional comments regarding **Food Security** in the management of protected farmland, please describe below.

When these questions are complete, skip to SECTION 7 on page 27.

RECREATION

Only complete these questions if you ranked **Recreation** as the most important consideration in managing protected farmland.

How much, if any, did your concern about the following items influence your decision to rank **Recreation** as the most important consideration in managing protected farmlands?

	Not at all		Some		A lot
Access for trail running	☐	☐	☐	☐	☐
Access for horseback riding	☐	☐	☐	☐	☐
Access for wildlife observation	☐	☐	☐	☐	☐
Access for mountain biking	☐	☐	☐	☐	☐
Access for agritainment (corn mazes, you-pick patches for example)	☐	☐	☐	☐	☐
Access to nature	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐

If you would like to include additional comments regarding the importance of **Recreation** in the management of protected farmland, please describe below.

When these questions are complete, skip to SECTION 7 on page 27.

COMMUNITY RELATIONSHIPS

Only complete these questions if you ranked **Community Relationships** as the most important consideration in managing protected farmland.

How much, if any, did your concern about the following items influence your decision to rank **Community Relationships** as the most important consideration in managing farmlands?

	Not at all		Some		A lot
Relationships between urban and rural populations	☐	☐	☐	☐	☐
Relationships between farmers and non-farmers	☐	☐	☐	☐	☐
Relationships between farmers and consumers	☐	☐	☐	☐	☐
Connections within local community	☐	☐	☐	☐	☐
Connections to agriculture	☐	☐	☐	☐	☐
Connections to farmers	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐

If you would like to include additional comments regarding the importance of Community Relationships in the management of protected farmlands, please describe below.

When these questions are complete, skip to SECTION 7 on page 27.

AGRICULTURAL HERITAGE

Only complete these questions if you ranked *Agricultural Heritage* as the most important consideration in managing protected farmland.

How much, if any, did your concern for the following items influence your decision to rank *Agricultural Heritage* as the most important consideration in managing protected farmlands?

	Not at all		Some		A lot
Having farmland for future generations	☐	☐	☐	☐	☐
Knowing that some of your food will come from this land	☐	☐	☐	☐	☐
Preservation of agricultural community	☐	☐	☐	☐	☐
Having friends or family that farm this land	☐	☐	☐	☐	☐
Nostalgia: it reminds you of your childhood	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐

If you would like to include additional comments regarding the importance of considering *Agricultural Heritage* in the management of protected farmlands, please describe below.

When these questions are complete, skip to SECTION 7 on page 27.

RE-LOCALIZATION OF THE FOOD SYSTEM

Only complete these questions if you ranked *Re-localization of the Food System* as the most important consideration in managing protected farmland.

How much, if any, did your concern about the following items influence your decision to rank *Re-localization of the Food System* as the most important consideration in managing protected farmlands?

	None		Some		A lot
Concentrated Food System	☐	☐	☐	☐	☐
Transparency of Food System	☐	☐	☐	☐	☐
Food Safety	☐	☐	☐	☐	☐
Corporate influence	☐	☐	☐	☐	☐

If you would like to include additional comments regarding the importance of *Re-localization of the Food System* in the management of protected farmland, please describe below.

When these questions are complete, skip to SECTION 7 on page 27.

PRESERVATION OF FUTURE GENERATIONS

Only complete these questions if you ranked *Preservation of Future Generations* as the most important consideration in managing protected farmland.

How much, if any, did your concern for the following items influence your decision to rank *Preservation of Future Generations* as the most important consideration in managing farmlands?

	None		Some		A lot
Having farmland for future generations	☐	☐	☐	☐	☐
Preservation of the agricultural community	☐	☐	☐	☐	☐
Loss of local agricultural knowledge	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐

If you would like to include additional comments regarding the importance of considering the *Preservation for Future Generations* in the management of protected farmland, please describe below.

When these questions are complete, skip to SECTION 7 on page 27.

ATTRACTIVENESS TO VISITORS

Only complete these questions if you ranked *Attractiveness to Visitors* as the most important consideration in managing protected farmland.

How much, if any, did your concern about the following items influence your decision to rank *Attractiveness to Visitors* as the most important consideration in managing farmlands?

	Not at all (1)	(2)	Some (3)	(4)	A lot (5)
Boulder's reputation in the natural foods industry	☐	☐	☐	☐	☐
Boulder's reputation for progressive open space planning	☐	☐	☐	☐	☐
Property prices	☐	☐	☐	☐	☐
Taxes	☐	☐	☐	☐	☐

If you would like to include additional comments regarding the importance of considering *Attractiveness to Visitors* in the management of protected farmland, please describe below.

When these questions are complete, skip to SECTION 7 on page 27.

SCENIC BEAUTY

Only complete these questions if you ranked *Scenic Beauty* as the most important consideration in managing protected farmland.

How much, if any, did your concern about the following items influence your decision to rank *Scenic Beauty* as the most important consideration in managing protected farmlands?

	None (1)	(2)	Some (3)	(4)	A lot (5)
Scenic beauty of farmlands	☐	☐	☐	☐	☐
Open space provided by farmlands	☐	☐	☐	☐	☐
Attractiveness of vistas from property	☐	☐	☐	☐	☐
Attractiveness of vistas on drive to and from property	☐	☐	☐	☐	☐

If you would like to include additional comments regarding the importance of *Aesthetics* in the management of protected farmland, please describe below.

When these questions are complete, skip to SECTION 7 on page 27.

OTHER

Only complete these questions if you ranked **Other** as the most important consideration in managing protected farmland.

How much, if any, did your concern about the following items influence your decision to rank **Other** as the most important consideration in managing protected farmlands?

When these questions are complete, go to SECTION 7 on page 27.

SECTION 7: FARMLAND PRACTICES

22. Are there certain uses that you think should not occur on farmland that has been protected with public funds? Check the items that you think should not be allowed on protected farmlands.

- ☐ Growing crops for the local foods market
- ☐ Growing crops for the commodities market (wheat, corn, sugar beets)
- ☐ Growing crops for biofuels
- ☐ Growing horticultural crops (e.g. trees, shrubs, flowers)
- ☐ Pasturing horses
- ☐ Pasturing livestock not including horses
- ☐ Providing on-farm activities such as corn mazes and hay rides
- ☐ Growing hay for horses
- ☐ Growing hay for livestock not including horses
- ☐ Using genetically modified seeds
- ☐ Using pesticides and fertilizers
- ☐ Using organic production methods
- ☐ Small farm with some animals
- ☐ Having a farm stand
- ☐ Having greenhouses/hoop houses
- ☐ Feedlot
- ☐ I do not think there should be restrictions.
- ☐ Other _____

23. A primary goal of farmland protection is limiting future development on the agricultural land. Some people also view farmland protection as a tool for limiting the type of farmland practices that occur on the agricultural land AND limiting future development. If Boulder County protects farmland, what are you most concerned with limiting? (Check all that apply)

- ☐ Limiting future development
- ☐ Limiting the type of farmland practices
- ☐ I do not know
- ☐ I do not have an opinion

Add additional comments here:

SECTION 8: INTERACTIONS WITH FARMLAND

24. We are interested in learning how you experience farmland in your daily life. Use the scale below to indicate how often you interact with farmland in the following ways.

	Daily	Weekly	Monthly	Once a year	Never
View from property	☐	☐	☐	☐	☐
View on drives to and from property	☐	☐	☐	☐	☐
Recreate in and around (hike, bike, bird watch, etc.)	☐	☐	☐	☐	☐
Shop at farmstand, you-pick patch, corn maze	☐	☐	☐	☐	☐
Pasture horses	☐	☐	☐	☐	☐
Farm, work as paid employee at a farm, or volunteer at a farm	☐	☐	☐	☐	☐
Participate in farm event (e.g., County Fair, Agricultural tour, horse show)	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐

Add additional comments here:

25. Do you actively seek out information about farming and agriculture?

- ☐ Yes
- ☐ No → **If No is selected, skip to Section 9 on page 30.**

26. When seeking information on farming and agriculture on which of the following, if any, do you rely?
(Check all that apply)

- ☐ Family
- ☐ Friends
- ☐ Neighbors
- ☐ Neighborhood group (e.g., homeowners group)
- ☐ Agricultural Extension
- ☐ Farmland Protection Programs
- ☐ County Agencies and Officials
- ☐ Environmental Organization _____
- ☐ Farmers' Organizations (Farm Bureau, e.g.) _____
- ☐ News Sources (Daily Camera, Denver Post, etc.) _____
- ☐ Local Group or Organization _____
- ☐ Popular Media (movies, books, etc.) _____
- ☐ Class on food and agriculture _____

Include additional comments here:

SECTION 9: AGRARIAN HERITAGE

27. Is there a history of farming in your family? (Check all that apply)

- ☐ Your generation
- ☐ Your parent's generation
- ☐ Your grandparent's generation
- ☐ Before your grandparent's generation
- ☐ None
- ☐ I do not know

28. Have you ever lived on a farm?

- ☐ Yes
- ☐ No → **If no is selected, skip to SECTION 10 on page 32.**

29. How many months have you spent on a farm?

- ☐ 0 - 3 consecutive months
- ☐ More than 3 consecutive months but less than 6 consecutive months
- ☐ More than 6 consecutive months but less than 1 year
- ☐ 12 consecutive months or more

30. What was the approximate size of the farm? If you spent your time on several farms, answer the next questions based on the farm you have the longest history with.

- ☐ Small (less than 15 acres)
- ☐ Medium (15 - 100 acres)
- ☐ Large (more than 100 acres)
- ☐ I do not know

31. What term best characterizes the farm?

- ☐ Non-Organic
- ☐ Organic (certified or practicing but not certified)
- ☐ Other _____

32. What was the primary product grown/produced on the farm?

- ☐ Livestock
- ☐ Commodity crops
- ☐ Vegetables and produce
- ☐ Fruit
- ☐ Dairy
- ☐ Hay
- ☐ Other _____

SECTION 10: COMMUNITY CONNECTIONS

33. Please indicate your relationship to the following organizations and communities listed below. **(Check all that apply)**

	Myself currently	Myself formerly	Relative	Close Friend	Acquaintance	None
Mountain bike community	☐	☐	☐	☐	☐	☐
Trail runners community	☐	☐	☐	☐	☐	☐
Hunting community	☐	☐	☐	☐	☐	☐
Hiking community	☐	☐	☐	☐	☐	☐
Birding or naturalist community	☐	☐	☐	☐	☐	☐
Horse riding community	☐	☐	☐	☐	☐	☐
Gardening community	☐	☐	☐	☐	☐	☐
Farming community	☐	☐	☐	☐	☐	☐
Environmental community	☐	☐	☐	☐	☐	☐
County/City Open Space Staff	☐	☐	☐	☐	☐	☐
Natural Foods Industry	☐	☐	☐	☐	☐	☐

SECTION 11: DEMOGRAPHICS

34. Do you own your current residence?

- ☐ Yes
- ☐ No

35. In what year did you move into your residence? _____

36. In what year were you born? _____

37. Are you?

- ☐ Male
- ☐ Female

38. What race or ethnic group do you identify as?

- ☐ White
- ☐ Black or African American
- ☐ Hispanic
- ☐ American Indian or Alaskan Native
- ☐ Asian
- ☐ Other

39. What best describes your marital status?

- ☐ Never married
- ☐ Widowed
- ☐ Divorced
- ☐ Now married
- ☐ Domestic partnership

40. How many children in the household are under 18 years of age?

- ☐ None
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ more than 4

41. What is the highest grade or year of school you completed?

- ☐ Eighth grade or less
- ☐ Some high school
- ☐ High school graduate
- ☐ Some college or technical school
- ☐ Technical or trade school
- ☐ College graduate
- ☐ Some graduate work
- ☐ Advanced degree (M.S., M.D., M.A., Ph.D., etc.)

42. Which of the following categories describes your household income?

- ☐ Less than \$25,000
- ☐ \$25,000 - \$34,999
- ☐ \$35,000 - \$49,999
- ☐ \$50,000 - \$74,999
- ☐ \$75,000 - \$99,999
- ☐ \$100,000 - \$124,999
- ☐ \$125,000 - \$200,000
- ☐ More than \$200,000

43. Use the space below to address any issues or leave comments that you think will help us better understand how you or others feel about farmland practices on land that is protected.

Appendix X: Map of Agricultural Lands in Boulder County, Colorado

