



Adoption of conservation easements among agricultural landowners in Colorado and Wyoming: The role of economic dependence and sense of place

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ARTICLE INFO

Article history:

Received 25 June 2010

Received in revised form 10 January 2011

Accepted 13 January 2011

Available online 16 February 2011

Keywords:

Conservation easements

Place attachment

Sense of place

Economic dependence

Land trusts

Agricultural landscape

ABSTRACT

The inter-mountain west is one of the most highly urbanized and rapidly growing regions in the United States. Conservation easements are one common tool used to protect rural and agricultural land from urban development. This paper examines the attitudinal and demographic characteristics of agricultural landowners to predict adoption of conservation easements. The study has two primary objectives: (1) to broaden the literature on sense of place and place attachment by including a measure of economic dependence as one dimension, and (2) to examine the relation of this dimension with attitudes towards land trusts and participation in conservation easements. Agricultural landowners ($N = 2266$) in Colorado and Wyoming were surveyed about their sense of place for their land, their attitudes towards land trusts, and perceived need for land conservation. Factor analysis of 12 measures of sense of place indicated that place identity, conservation ethic, and economic dependence are distinct dimensions of sense of place among agricultural landowners. Logistic regression analyses revealed that economic dependence had a significant and negative relation with landowner's trust of and trusts and placement of a conservation easement on agricultural land, whereas a conservation ethic and spiritual attachment are positively related. Two main implications for land trusts are that time spent contacting landowners is time well spent and intake questionnaires could be used to screen and owners for both a conservation ethic and a sense of economic dependence providing information that might improve the possibility of reaching an easement agreement.

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1. Introduction and background

Conservation easements are a policy tool used to protect lands that provide a community's sense of place or other amenities such as preservation of wildlife habitat or open space (Gustanski and Squires, 2000). A conservation easement is a voluntary but legally binding agreement (hereafter we refer to legal agreements as *conservation easements* and the organizations that manage them as *land trusts*), where the landowner commits to limit development and/or future changes in land use thereby protecting socially desired amenities. In qualitative studies, landowners describe being motivated to participate in conservation programs based on a commitment to conservation, stewardship, and place attachment;

in contrast, they describe financial considerations as hindering participation (Cross, 2001; Klapproth and Johnson, 2001; Zollinger and Krannich, 2001). There is a growing body of research on motivations for engaging in conservation easements, but there are few empirical studies on the barriers to adoption of conservation easements, particularly for agricultural producers (Kabii and Horwitz, 2006).

When considering the relation between place attachment and willingness to adopt conservation easements, agricultural landowners are unique because their sense of place develops around a working landscape. Agricultural land is part of a cultural landscape based on its use for agricultural purposes, separate from its residential, recreational, aesthetic or spiritual values (Kaltenborn and Bjerke, 2002; Lockwood, 1999). Agricultural property also holds unique meanings because it is also a source of financial well-being and a place of work (Gustafson, 2001; Hiss, 1990; Sixsmith, 1986). Thus, agricultural landowners develop place attachments through relationships – work and economic dependency – that most urban homeowners and second-homeowners do not experience. This study examines the relationship between the unique aspects of sense of place among agricultural landown-

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ers as it influences their willingness to participate in conservation easements.

This manuscript has two primary objectives. First, we seek to broaden the literature on *sense of place* to include *economic dependence* as a dimension experienced by agricultural landowners. [Kabii and Horwitz \(2006\)](#) hypothesize that economic dependence is one predictor of participation in conservation easements and protective covenants. We use the term *sense of place*, rather than *place attachment* for two reasons. Sense of place generally is used more broadly than place attachment, and it is more inclusive of a broad range of relationships and processes ([Hay, 1998](#); [Hummon, 1992](#); [Trentelman, 2009](#)). Secondly, in some applications, place attachment – representing only the affective dimension of connections between people and places – is subsumed by sense of place ([Jorgensen and Stedman, 2001](#)), although this interpretation has been debated ([Low and Altman, 1992](#), p. 4).

Given the potential importance of sense of place for agricultural landowners considering land use decisions, the second research objective is to examine the relations between economic dependence, attitudes towards conservation, perceived need for land conservation, and participation in conservation easements. Qualitative studies of landowners participating in conservation easements found that personal attachment to the land and commitment to stewardship are described as motivations for participation ([Ernst and Wallace, 2008](#); [McLaughlin, 2004](#); [Rilla and Sokolow, 2000](#)); however, these studies primarily focused only on those who adopted conservation easements, excluding non-participants and providing little insight as to factors discouraging participation. [Zollinger and Krannich \(2001\)](#) surveyed landowners and found that landowner education about conservation programs increased willingness to enter into a conservation agreement, while financial consideration reduced participation. Similarly, the literature on sustainable agriculture reveals that financial costs and incentives are a primary factor in conservation decisions ([Buttel et al., 1990](#); [Ernst and Wallace, 2008](#); [Klapproth and Johnson, 2001](#); [Parker, 2004](#); [Rilla and Sokolow, 2000](#)). We believe these threads of research indicate that examining the relationship between aspects of sense of place, attitudes towards conservation land trusts, and participation in conservation easements among agricultural landowners in Colorado and Wyoming will provide unique insights into the factors influencing conservation decisions.

When considering the various relations people have with places – their sense of place – we predicted that economic dependence would be distinct from other dimensions. In addition, we hypothesized that economic dependence would have a negative relation with participation in conservation easements, whereas other dimensions such as place identity and a conservation ethic would be positively related with conservation behaviors.

2. Literature review

2.1. Dimensions of sense of place

Research on sense of place has identified three distinct dimensions – place attachment, place identity, and place dependence. We propose adding economic dependence. Recent studies indicate that sense of place encompasses separate and measurable dimensions ([Hummon, 1992](#); [Jorgensen and Stedman, 2006](#); [Kyle et al., 2005](#); [Williams and Vaske, 2003](#)). Each of these three dimensions represents a distinct type of experience in place, emotional attachments, cognitive expressions, and behavioral expectations ([Jorgensen and Stedman, 2001](#); [Kyle et al., 2005](#); [Williams and Vaske, 2003](#)).

Of the three most commonly measured dimensions, *place attachment* has been the most thoroughly researched and defined.

[Hidalgo and Hernandez \(2001\)](#) argue that the fundamental aspect of attachment is “the desire to maintain closeness to the object of attachment” (p. 274). In addition to emotional attachments, people also develop *place-based identities*. As people live, work, or recreate in places, they develop identities that are associated with their participation in activities and groups of people in that place. Place identity is a component of self-identity ([Proshansky, 1978](#)), which enhances a sense of belonging within a community ([Relph, 1976](#)). More recent quantitative studies have found that place identity is conceptually distinct from place attachment and place dependence ([Jorgensen and Stedman, 2006](#); [Kyle et al., 2005](#); [Williams and Vaske, 2003](#)). *Place dependence* is a functional attachment – reflecting how the characteristics of a place assist a person in meeting action-oriented goals (e.g., recreation, relaxation, or income) ([Jorgensen and Stedman, 2001](#); [Stokols et al., 1983](#); [Williams and Vaske, 2003](#)). Unlike other aspects of sense of place, place dependence has been almost exclusively examined in recreational settings, among recreational property owners ([Jorgensen and Stedman, 2006](#)), and among visitors to national forests, wilderness areas, state parks, national parks, and other recreation areas ([Kyle et al., 2004](#); [Williams et al., 1992](#); [Williams and Vaske, 2003](#)).

Studies of sense of place and place attachment have predominantly examined the affective aspects of residents’ attachments to the physical environment (i.e., their house, neighborhood, and city, the natural environment) and their social relationships to people they live with, including neighbors and the larger community ([Brehm et al., 2004](#); [Cuba and Hummon, 1993](#); [Hernandez et al., 2007](#); [Hidalgo and Hernandez, 2001](#)). While many dimensions of sense of place and place attachment have been studied, there is a paucity of literature examining the economic dependence of agricultural landowners as a subjective experience and dimension of sense of place which may also impact conservation decisions. The motivation and rationale for adding economic dependence as a dimension is presented in the following section.

2.2. Motivations for conservation easements

Among spheres of behavior in which economic dependence could matter is conservation, and within that, the use of conservation easements is of particular interest. In the past two decades, conservation easements have emerged as one of the most commonly used policies for land protection ([Gustanski and Squires, 2000](#); [Wyerman, 2006](#)). The general public and conservation organizations look to agricultural lands to provide environmental amenities such as open space ([Kline and Wichelns, 1994, 1996](#); [Pfeffer and Lapping, 1994](#)), natural resource management and habitat preservation ([Byrd et al., 2009](#); [Rosenberger, 1998](#)), and non-market agricultural services such as locally grown food and preservation of rural lifestyles ([Duke and Aull-Hyde, 2002](#); [Ryan, 2002](#)). Agricultural lands comprise a substantial portion of the land currently under conservation easements, and many possible motivations for conservation exist. Several authors indicate that landowners respond to financial incentives for land protection ([Anderson, 2004](#); [Kline and Wichelns, 1994](#); [Rilla, 2002](#)), although others suggest that non-financial rewards prevail in priority. These non-monetary benefits may lead landowners to forego some financial compensation to see their lands protected ([Marshall, 2002](#); [McLaughlin, 2004](#); [Hoag et al., 2005](#); [Keske, 2008](#)).

Holding an ethic of stewardship has been found to motivate landowners to engage in land protection programs ([Lynch and Lovell, 2003](#); [Miller et al., 2011](#); [Natori and Chenoweth, 2008](#); [Rissman et al., 2007](#)). The role of place attachment, however, is less consistently related to conservation behaviors. [Gosling and Williams \(2010\)](#) found that place attachment was not related to conservation practices, while [Walker and Ryan \(2008\)](#) found that

is was positively related to support for conservation planning. Research on motivations for participation in conservation easements has not examined all the dimensions of sense of place, including economic dependence, in relation to attitudes about conservation land trusts nor used them to predict participation in conservation easements and protective covenants. This study seeks to expand knowledge about decisions to adopt conservation easements by studying a broad sample of agricultural landowners and examining the relation between agricultural landowner sense of place, especially economic dependence upon the land, and willingness to enter conservation easement agreements.

3. Methods

3.1. Data collection

To examine sense of place dimensions among landowners, we developed a self-administered questionnaire that was directly mailed to landowners in Wyoming and Colorado. Survey distribution was conducted from January – March 2007 by the United States Department of Agriculture's National Agricultural Statistical Service (NASS) agency to preserve the anonymity of participants. NASS, which routinely administers survey and census data for agricultural research, directly mailed a seven-page questionnaire to a stratified sample of Colorado and Wyoming landowners. The sample consisted of landowners whose property was at least 50 acres in size, and who reported at least \$1000 in agricultural sales in 2002 (National Agricultural Statistics Service, 2002). The sample was further stratified into five tiers of farm income, reflecting farms at different levels of agricultural sales categories as defined by the 2002 Agricultural Census: > \$50,000; \$49,999–\$25,000; \$24,999–\$10,000; \$9999–\$5000; \$4999–\$1000 (National Agricultural Statistics Service, 2002). Roughly 75% of the sample consisted of Colorado landowners, while 25% of the sample reflected Wyoming landowners, relatively proportionate to the states' population distribution.

The questionnaire was sent to property owners holding land in either Colorado or Wyoming, although some landowners were actually full or part-time residents of other states. Surveys were distributed using a modified Dillman (2000) technique, which also involved a follow-up phone call administered to 10% of non-respondents, rather than all non-respondents, to improve the overall response rate and allow for examination of potential non-response bias. The initial sample size was 4935; a total response of 2270 returned questionnaires resulted in a 46% response rate for the study. Although the survey non-response rate was slightly under 50%, this is quite typical of mail surveys (Groves, 2006; Tourangeau, 2004). The total *N* available for analysis varies from 1902 (Tables 3 and 4) to 2270 (Tables 1 and 2), due to missing values in one version of the survey, which was experimental in nature and did not include all items.

We assessed the potential for non-response bias by comparing characteristics of our sample to the population as reported by the NASS 2002 Agricultural Census state level data. We found the sample to be highly representative of state populations, thus reducing the potential for response bias; we provide a few illustrative examples here. The survey sample exactly matched the proportional distribution between Colorado and Wyoming residents in the Agricultural Census data (76%). The average total deeded acres of the sample (1701 acres) closely matched the weighted average of deeded acres (1656 acres) – calculated by multiplying the state population distributions by the state deeded acres average (991 acres in Colorado and 3551 acres in Wyoming). The proportion of respondents for each age group, gender of operators, and education category were very similar to the Ag Census data for each state.

Table 1

Descriptive statistics for primary agricultural operator.

Data shown as a proportion or as mean (std. dev) (N = 2270)	
Female gender	0.16
Colorado resident	0.76
R or spouse works off farm	0.58
Age <35	0.04
Age 35–44	0.06
Age 45–54	0.23
Age 55–59	0.16
Age 60–64	0.15
Age 65–69	0.13
Age 70 and over	0.24
High school grad	0.27
Some college	0.26
Vocational/technical degree	0.10
Bachelor's degree	0.20
Some graduate education	0.05
Graduate degree	0.12
Gross agricultural sales, \$1000s	59.29 (119.85)
Total deeded acres owned, 100s	17.01 (58.19)
Pct. income from farm/ranch	43.26 (38.14)
Land borders subdivision	0.28
Economic dependence scale*	3.84 (1.18)
Place identity scale*	4.14 (0.91)
Conservation ethic scale*	4.36 (0.69)
Land in my community needs protection	3.44 (1.42)
Some organization has approached me about easement	0.19
Trust land trusts to protect my interests	0.29
Easement currently in place	0.11
Land borders land with easement	0.21

* Scale scores are means across multiple Likert items, where 5 = strongly agree down to 1 = strongly disagree.

Table 1 presents descriptive statistics for the “primary agricultural operator” of the 2270 returned questionnaires. The majority (84%) of the operators was male, consistent with the 2002 Agricultural Census data, from which the sample was drawn. Approximately three-quarters (76%) of the operators were Colorado landowners. More than half (58%) reported having a spouse who worked off the farm. The age of the agricultural operator, as reported by survey respondents, also reflects the aging agricultural population. More than half (51%) of the operators were over the age of 60 while only 10% of the operators were younger than 45.

Relative to the overall population of agricultural operators, participants in this study were well-educated; nearly three-quarters reported some level of post-high school education. Thirty percent held a bachelor's or vocational degree and 17% either earned a graduate degree or had some graduate school training. The average gross agricultural sales and total deeded acres owned reflects large to medium-sized operations for western states, with averages of \$59,290 and 1700 acres, respectively. As is common with wealth and income measures, these variables were positively skewed, with large standard deviations, which in the case of acreage led the use of its logarithm in analysis. Values for the agricultural sales and acres owned were coded as midpoints of category intervals chosen by respondent. The average percentage of household income coming from the farm was 43.26%.

3.2. Measurement

The questionnaire measured dimensions of sense of place with 15 Likert items pertaining to attitudes towards participant's agricultural land. Response categories ranged from 1 = “strongly disagree” to 5 = “strongly agree”. The items included various topics, including “identification with the land/community”, “commitment to stewardship”, “sense of belonging”, and “economic dependence” on the land. Not surprisingly, a factor analysis identified twelve items that clustered together as three distinct dimensions – conservation ethic, place identity, and economic dependence. For each

Table 2
Rotated factor loadings for first three factors extracted from analysis of sense of place items.

Sense of place items	Component factor loading		
	Conservation ethic ($\alpha = 0.83$)	Place identity ($\alpha = 0.85$)	Economic dependence ($\alpha = 0.85$)
Land should be preserved for future generations	0.63	0.33	
Personal history and identity closely tied to land	0.33	0.54	
Agriculture is part of historical character of community	0.50	0.30	
I have responsibility to conserve nature	0.73		
I manage land to maximize benefit to my community	0.58		
Important to be a good steward	0.63		
My community is where I most belong		0.77	
Feel more myself here than anywhere		0.87	
Feel a spiritual connection to where I live	0.32	0.69	
Natural amenities should be preserved for future generations	0.69		
If the natural amenities changed I would not stay			
Land in my community offers the natural amenities I am looking for in a place to live	0.35	0.43	
Family's livelihood depends on economic productivity of land			0.77
My future livelihood depends on having flexible land use			0.77
Financial well-being conflicts with plans for conservation			0.36
Prop. Variance.	0.310	0.308	0.179

Iterated principal factor extraction, with varimax rotation of first four factors. Factors with loadings less than 0.300 are suppressed. Items used for each scale are shown in bold. Scale scores are based on means of unstandardized items.

dimension, we constructed an additive scale. As shown in Table 2, each of the twelve individual items loaded strongly on only one of the factors, indicating that the three factors are separable dimensions of sense of place and that the items in each dimension are non-overlapping. The final analysis assessed the relation between dimensions of sense of place and landowner attitudes towards land trusts, need for conservation, and placement of conservation easements. These twelve items and the appropriate dimensions are described briefly in the following section.

3.2.1. Conservation ethic

The scale for this dimension comprised six items, including “land should be preserved”; “agriculture is part of the community's history”; “respondent has a responsibility to conserve land”; “respondent manages land to maximize benefit to community”; “importance of good stewardship”; and “preservation of natural amenities”. All six items capture a sense of responsibility for conserving and protecting land and its natural amenities for the benefit of one's community, including future generations. These items were combined into a single measure, using the mean of all items (Cronbach's $\alpha = 0.832$).

3.2.2. Place identity

The sense of belonging and identification was measured with a four item additive scale: personal history and identity tied to the land; community belonging; feeling “more myself here than anywhere”; and feeling a spiritual connection to where the respondent lives. This dimension captures a person's sense of belonging and identification with his or her land and surrounding community. These items were combined into a single scale using the mean of all items (Cronbach's $\alpha = 0.849$).

3.2.3. Economic dependence

This dimension was measured with two items, family dependence on economic productivity from the land, and future livelihood depending upon flexibility to use land the way the respondent deems to be appropriate. This dimension captures the degree to which a person earns income from land and depends upon land for financial well-being. These items also were combined into a single scale using the mean of the items (Cronbach's $\alpha = 0.845$).

3.2.4. Attitudes

In a separate section of the questionnaire, landowners were asked about their attitudes towards conservation land trusts and

the need for conservation. Landowner attitude about need for conservation was measured as a Likert item, “I believe land in my community needs protection from conversion to other uses, like houses” (1 = strongly disagree to 5 = strongly agree). Two additional items were asked as simple yes/no items: “I trust land trusts to protect my interests if they hold my easement”, and “Is there currently a conservation easement in place for a parcel on the land you own or manage?”

4. Results

4.1. Dimensions of sense of place

To answer the first research question, “Is economic dependence a unique dimension of sense of place?” we examined the 12 attitudinal items using factor analysis. As described above, 12 items factored (see Table 2) into three distinct scales of conservation ethic, place identity, and economic dependence. Two of the three dimensions of sense of place—conservation ethic and place identity – are closely correlated ($r = 0.646$), while the third – economic dependence – is less so (0.40 with place identity, and 0.08 with conservation ethic). The conservation ethic scale had the highest average, 4.36, on a scale of 1–5, indicating that most landowners in this sample feel a strong commitment to stewardship and land conservation (see Table 1). Landowners also generally scored high on the place identity scale with a mean of 4.14. The economic dependence scale had a mean value of 3.84 and a larger standard deviation than the other two scales, indicating that there is more variability in this scale than in the others, presumably reflecting the diversity in landowners' actual financial relation to their properties. These correlations suggest that “a sense of belonging” to a place is associated with commitment to conservation. Correlations also suggest that economic dependence on the land is weakly related to place identity but unrelated to a commitment to conservation and stewardship. These correlations suggest that economic dependence is a unique dimension of sense of place.

4.2. Perceived need for local land conservation

Table 3 presents the results of an ordinal logistic regression with “land in my community needs protection from other uses” examined as a response, which was coded with higher ratings indicating stronger agreement. Tables 3 and 4 summarize the results of logistic

Table 3
Ordinal logistic regression of “Land in my community needs protection from other uses” on various predictors.

	<i>b</i>	(SE)	OR ^a
Years of residence	−0.003	−0.003	0.951
Gender (female = 1)	0.166	−0.143	1.180
+Residence (CO = 1)	−0.049	−0.112	0.952
R or spouse works off farm (=1)	0.037	−0.120	1.018
Age 35–44 ^b	0.093	−0.363	1.098
Age 45–54	0.163	−0.331	1.177
Age 55–59	0.082	−0.340	1.085
Age 60–64	0.145	−0.344	1.156
Age 65–69	0.297	−0.361	1.346
Age 70 and over	0.362	−0.364	1.437
Some college ^c	−0.147	−0.135	0.863
Vocational/technical degree	0.077	−0.181	1.080
Bachelor's degree	0.035	−0.146	1.035
Some graduate education	−0.001	−0.223	0.999
Graduate degree	0.056	−0.175	1.058
Ln of deeded acres in 100s	−0.0998***	−0.037	0.854
Gross agric. sales, in \$1000s	−0.00020	0.000	0.976
Percent of income from farming/ranching	−0.00321 [†]	−0.002	0.886
Economic dependence scale	0.067	−0.057	1.081
Place identity scale	0.218***	−0.076	1.208
Conservation ethic scale	1.007***	−0.100	1.921
Approached by land trusts (yes = 1)	0.586***	−0.131	1.797
Threshold 1	3.238***	−0.521	
Threshold 2	4.145***	−0.523	
Threshold 3	5.312***	−0.530	
Threshold 4	6.252***	−0.537	
Observations	1504		
Adjusted R ₀ ² (Lacy, 2006)	0.114		
McFadden's R ²	0.0622		

^a Odds ratio. For continuous variables, these are for a one-standard deviation increase in the covariate, i.e., semi-standardized odds ratio. Ordinal logistic models generalize binary logistic regression to ordinal outcomes (see note at Table 4 for background detail on binary logistic models, odds ratios, and standardized coefficients). The slope coefficients give the slope with respect to each explanatory variable of the cumulative logit, that is, the natural logarithm of the odds that a person's response is in category 2 or above as opposed to 1, category 3 or above as opposed to anything lower, category 4 or above as opposed to anything lower, and so forth. While this model has only a single slope for each explanatory variable, there are separate thresholds or cutpoints for each such cumulative category division, which function like intercepts usable for predicting cumulative logits, probabilities, odds, and so forth. Exponentiating the ordinal logit coefficients makes them interpretable as odds ratios, giving the predicted multiplicative effect of a unit change in any X on the odds that the response is in category 2 or above as opposed to 1, 3 or above as opposed to 1 or 2, and so forth. For more explanation and technical detail, see e.g., Long (1997).

^b Reference category for age is “less than 35”.

^c Reference category for educational attainment is high school graduate.

[†] $p < 0.1$.

*** $p < 0.01$.

regression models, binary and ordinal, and we interpreted results in terms of odds ratios, where a value larger than 1 indicates a positive relationship and values between 0 and 1 indicate negative relationships. The predictor variables included demographic characteristics of the landowners, characteristics of the land, and all three dimensions of sense of place. In addition, this model included the variable “I have been approached by land trusts,” since an experience of this kind would be expected to alter landowners' perceptions (see below for discussion). In Tables 3 and 4, the total *N* available for analysis varies from 1411 to 1504.

In this analysis, we found that two of the dimensions of sense of place strongly predicted perceived need for land protection. Place identity and conservation ethic both showed substantial and significant relations to the perception that land in the community needs protection. In particular, the slope with respect to one standard-deviation increase in the conservation ethic scale corresponds to an odds ratio of about 1.9, while the same semi-standardized odds ratio for the place identity scale was about 1.2. These results show that a general adherence to a conservation ethic was linked with

a perceived need for local land protection. The economic dependence scale, by contrast, had a non-significant semi-standardized odds ratio of 1.08 to “perceived need” for land protection.

Perceived need for land protection also was related to being approached by land trusts for conservation easement participation, with a slope coefficient corresponding to an odds ratio of about 1.8. While having been approached by a land trust is predictive in this equation, a causal mechanism cannot be assessed. Two explanations are equally plausible. Being approached by a conservation land trust may increase the landowner's knowledge about land trusts and conservation easements, thus increasing their perception that land in the region needs to be conserved. Another explanation is that land with higher conservation values is of greater interest to land trusts, leading to landowner contact.

The final significant predictor in this model was deeded acres, with a negative logarithmic association to land protection; increases in land holding size were associated with lower belief that land needs protection, an association most pronounced for smaller acreages. Note here that while deeded acreage was a significant predictor, economic dependence was not, further indicating that the subjective perception of economic dependence is not equivalent to objective measures of economic relationship to land. This finding fits with the common finding that committed agricultural producers have economic interests that might be threatened by land protection programs. This result also fits with theory from land economics suggesting that the greater value of a contiguous acreage creates a financial incentive for landowners to keep large tracts of agricultural land intact. Therefore, it is not surprising that landowners of large properties viewed conservation policies as unnecessary to facilitate land protection, although conservation organizations and others in the community may view this quite differently.

4.3. Attitudes towards land trusts and placement of conservation easements

Finally, we examined the research questions, “What is the relation between dimensions of sense of place and trust of land trusts?” and, “What predicts participation in conservation easements (socio-demographics, land characteristics, dimensions of sense of place, and attitudes towards land trusts)?” Table 4 presents the results for two binary logistic regression analyses, one with perceived trust of land trusts as a response variable, and another with current existence of a conservation easement on the land (both coded as 1 = yes vs. 0 = no). For the item “I trust land trusts to protect my interests,” five variables were statistically significant predictors. Persons with higher scores on the economic dependence scale were less likely to trust land trusts to protect their interests (odds ratio of 0.8 for a one standard deviation increase), a finding that presumably reflects the interests of the economically dependent producer to preserve financial return from landholdings. Landownership in Colorado was also associated with trust, with Colorado landowners having 1.8 times the odds of Wyoming landowners of saying they trust land trusts. Colorado has approximately five-times the number of land trusts compared to Wyoming, potentially making Colorado landowners more likely to be familiar with land trusts. Landowners with graduate degrees were slightly more likely to trust land trusts (odds ratio of 1.6). Landowners who rated high on the conservation ethic scale also were more likely to trust land trusts (odds ratio of 1.4 for a one standard deviation increase). Place identity, though, had a negligible relationship with trust of land trusts. Percent of income from farming/ranching was positively related to trusting land trusts, also with an odds ratio of about 1.2. Finally, having been approached by a land trust organization was strongly associated with trust of land trusts (odds ratio 1.6 for having had this experience). This suggests that contact with landowners may be a key strategy for encouraging participation in

Table 4
Binary logistic regression of “I trust land trusts” and “The land I own/manage currently has a conservation easement” on various predictors.

	Trust land trusts to protect my interests			Current easement on land		
	B	(SE)	OR ^a	B	(SE)	OR ^a
Years of residence	−0.00489	(0.00409)	0.995	0.00859	(0.00642)	1.172
Gender (female = 1)	−0.143	(0.181)	0.867	−0.557*	(0.302)	0.573
Residence (CO = 1)	0.588***	(0.155)	1.801	0.852***	(0.267)	2.344
R or spouse works off farm (=1)	0.0419	(0.153)	1.043	0.0423	(0.226)	1.043
Age 35–44 ^b	0.384	(0.500)	1.469	−0.895	(0.646)	0.409
Age 45–54	0.121	(0.462)	1.129	−1.245**	(0.581)	0.288
Age 55–59	0.345	(0.471)	1.412	−0.655	(0.586)	0.520
Age 60–64	0.518	(0.475)	1.678	−0.533	(0.592)	0.587
Age 65–69	0.426	(0.492)	1.531	−0.813	(0.626)	0.443
Age 70 and over	0.152	(0.498)	1.165	−0.959	(0.648)	0.383
Some college ^c	−0.201	(0.177)	0.818	0.516*	(0.281)	1.675
Vocational/technical degree	−0.184	(0.241)	0.832	0.800**	(0.347)	2.225
Bachelor's degree	0.111	(0.189)	1.117	0.265	(0.307)	1.304
Some graduate education	0.461*	(0.280)	1.586	−0.142	(0.480)	0.868
Graduate degree	0.380*	(0.215)	1.134	0.677**	(0.320)	1.968
Deeded acres, in 100s	0.000242	(0.00132)	1.014	0.000716	(0.00159)	1.043
Ln of deeded acres, in 100s	−0.0666	(0.0540)	0.900	0.0168	(0.0801)	1.027
Gross agric. sales, in \$1000s	−0.000609	(0.000563)	0.927	−0.000734	(0.000833)	0.913
Percent of income from farming/ranching	0.00549**	(0.00240)	1.230	0.00732**	(0.00369)	1.318
Economic dependence Scale	−0.205***	(0.0702)	0.787	−0.221**	(0.105)	0.772
Place identity Scale	0.0360	(0.0959)	1.032	−0.0668	(0.149)	0.944
Conservation ethic Scale	0.341***	(0.124)	1.406	0.748***	(0.221)	1.632
Approached by land trusts (yes = 1)	1.327***	(0.156)	1.637			
Land needs protection			0.199**	(0.0771)	1.318	
Trust land trusts (yes = 1)			1.354***	(0.189)	3.873	
Constant	−2.417***		−6.588***	(1.081)		
N	1424		1411			
Cragg-Uhler R ²	0.144		0.207			

^a Odds ratios. For continuous variables, these are for a one-standard deviation increase in the covariate, i.e., semi-standardized odds ratio. Results for the binary logistic regression models are displayed using odds ratios obtained by exponentiating the logit coefficients, an approach popular in many disciplines (e.g., sociology, public health, and psychology). An odds ratio describes the predicted multiplicative effect of a unit change in any X variable on the odds that the response occurs in a particular category. Because a one unit change in an X variable (e.g., one acre) is often not of substantive interest, we have reported odds ratios with respect to a one standard deviation change, a so-called semi-standardized odds ratio, for continuous predictors. So, if the semi-standardized odds ratio from a binary logistic regression is 2.0 for a given X variable, this indicates that a one standard deviation change in X is predicted to double the odds of being in the 1 (yes) as opposed to 0 (no) category.

^b Reference category for age is “less than 35”.

^c Reference category for educational attainment is high school graduate.

* $p < 0.1$.

** $p < 0.05$.

*** $p < 0.01$.

conservation easements, or conversely, that persons who already trust land trusts are more likely to have contact with land trusts.

Table 4 also presents binary logistic regression results for “Is there currently an easement on the land you own or manage?” This model uses the same predictors as the previous one, but with the addition of the two attitudinal items, “I trust land trusts” and “land in my community needs protection”. Demographic characteristics that predicted placement of a conservation easement include state of residence, gender, age, and education. Women owners were half as likely as men to have a conservation easement in place on their property (odds ratio of approximately 0.5), while Colorado landowners were more than twice as likely (odds ratio = 2.2) than Wyoming landowners to have agreed to an easement. Colorado has a much larger urban and environmentalist population than the more traditional state of Wyoming, which may encourage Colorado landowners to have a greater sense of urgency to protect agricultural lands from encroaching urbanization. Landowners in the 35–54 and 45–54 age brackets were much less likely (odds ratios of 0.32 and 0.29) than those under the age of 35 to have an easement on their property. Landowners with a vocational/technical degree, some college education, or a graduate degree were more likely (odds ratios of and 2.4, 1.7, and 1.8, respectively) than those with high school degrees to have an easement in place.

The relation of placing a conservation easement on one's land to economic factors is mixed. Size of landholding and agricultural sales was not related to placing a conservation easement. Percent of income from farming and ranching was positively associated with

having an easement, with an odds ratio of 1.3 for a one standard deviation (38%) increase in percent farm/ranch income. However, landowners who rated high on the subjective economic dependence scale were somewhat less likely to have an easement (odds ratio of 0.80 for a one standard deviation increase). This negative relation indicates that perceived economic dependence is distinct from objective measures of economic dependence (e.g. percent income or agricultural sales). Economic dependence can make the typically permanent decision to enter into an easement too risky to be attractive for landowners without other sources of wealth and income. Additionally, having a conservation easement in place was strongly positively related to expressing a conservation ethic (odds ratio of 1.6 for a one standard deviation increase on the conservation scale), trust for land trusts (odds ratio of 4.0 for saying yes), and the perceived need for land protection (odds ratio of 1.4 for a one standard deviation increase). These findings are all consistent with past research.

A concern in these analyses is the relatively large number of respondents excluded from the analyses due to missing values, about 20–25% of the total number of respondents in Tables 3 and 4 any respondents declined to answer the response variable “I trust land trusts...” (Table 4; 11% missing), but only 5% of respondents did not answer on “Land needs protection...” or “Current Easement.” To investigate the potential problems associated with the missing values in the response variables, we examined the relationship of having a missing value “I trust land trusts...” to other variables of interest, using a binary logit model with all covariates

of Tables 3 and 4 used as predictors of being missing on each of these response variables. This analysis showed that being missing on the “I trust land trusts...” question was related to one education category (“some college,” odds ratio 0.52, $p < 0.10$), to the place identity scale (negatively related, semi-standardized odds ratio of 0.76, $p < 0.10$), and to conservation ethic (odds ratio of 1.4 for a one standard deviation increase, $p < 0.05$). This last relationship seems the only one large enough to be of some concern, and it indicates that some survey respondents who have a strong conservation ethic opted not to answer the question about trusting land trusts, thus under-representing those with a strong conservation ethic in the regression equations. However, our analysis showed that this difference is too small to have altered the results substantially.

As for the response variables in Table 4, the numbers of missing cases are relatively small on many individual explanatory variables, typically less than about 5% of the total number of respondents. However, predictors with larger numbers of missing values include log of land acreage (9%), agricultural sales (9%), and percent of income from farming/ranching (10%). We cannot be certain how the missing values and their relation to various outcomes might have affected relationships found in the data. They may have biased our estimates of relationships towards 0. If occurrence of missing values caused the sample available for an analysis to be differentially selected on the outcome variable (e.g., under- or over-representing higher values), this would cause a selection bias, which, other things equal, tends to make observed slopes underestimate the true slopes (Dubin and Rivers, 1990). So, for example, the relatively weak relationships of our outcome variables with income and acreage variables could in part reflect such a problem.

To examine missing value occurrence in the explanatory variables, we regressed each of the three response variables on indicators of being missing on the several explanatory variables noted above as having substantial percentages of missing values. In an ordinal logistic model for strength of belief that “Land...needs protection”, the only notable relationship was a slight negative relationship between it and a missing response on agricultural sales (odds ratio of 0.79, $p > 0.15$). For “I trust land trusts...”, the binary logit model showed this variable to have substantial negative relationships with being missing on the acreage question (odds ratio of 0.43, $p < 0.005$), missing on agricultural sales (odds ratio of 0.51, $p < 0.01$), and missing on percent income from farming/ranching (odds ratio of 0.72, $p < 0.15$). This suggests a pattern in which respondents with concerns about privacy were more likely to decline to respond. Finally, the regression of “Current Easement...” showed none of the explanatory variables with substantial numbers of missing cases to be associated with having a current easement.

5. Discussion

Findings from this study have implications for studies of sense of place and a variety of conservation efforts. Economic dependence has been hypothesized to diminish the motivation for participation in conservation programs (Kabii and Horwitz, 2006), and we found that to be the case among agricultural landowners in Colorado and Wyoming. Two key findings are significant here. First, perceived economic dependence on the land is a subjective experience, related to but separate from farm income and land characteristics. Second, economic dependence is positively related to a conservation ethic, but it is negatively related to holding a conservation easement. This finding implies that a conservation ethic should not be assumed to indicate support for any one type of conservation practice or policy. In other words, some landowners may hold a personal commitment to conservation and being good stewards,

but they may not be willing to place a conservation easement on their property because of financial considerations.

Two main findings should inform the work of land trusts and conservation agencies. First, our findings support the model proposed by Kabii and Horwitz (2006) illustrating that landowners might experience competing motivations and barriers to participation in conservation programs. Those farmers and ranchers who depend on their land for a living may experience a strong place identity and hold a conservation ethic; but, they also have substantial motivation to avoid restrictions on land use flexibility. In the field of economics this is related to option value, where producers believe there is value in waiting to place an easement because placing an easement too soon could cause them to forego potential benefits in the future. Therefore, conservation organizations need to approach agricultural landowners with a variety of conservation options for land protection which meet the needs of the landowner, while also providing conservation value.

Second, our findings suggest that intake questionnaires might serve multiple purposes. While we cannot assert the direction of causality, our findings indicated that being approached by a land trust was strongly positively associated with trust, and trust in land trusts increased the likelihood of holding a conservation easement nearly fourfold. The causal direction of the relationship between contact and trust could be easily tested with simple pre- and post-contact questionnaires. Land trusts may want to use an intake questionnaire, similar to the intake procedure recommended by the Land Trust Alliance (2004), to screen landowners for dimensions of sense of place, as well as knowledge and trust of land trusts. Information regarding sense of place dimensions could be used to improve the possibility of a successful easement negotiation between a landowner and land trust. For example, conservation ethic and place identity were significant for the perception of “land in my community needs protection.” Thus, appealing to agricultural landowners’ perceived need for land protection in an appropriate manner may be a good entree for laying the groundwork for future, more personal interactions. Although our study uses a regional sample, sense of place is a universal experience (Relph, 1976), and we would expect to see the same general patterns of relationship between sense of place dimensions and support for conservation (positive for conservation ethic and negative for economic dependence) in other regions.

A limitation of the current study is the robustness of the economic dependence scale. Unlike the other two scales, which include four and six items, this scale consists of only two items. While the two measures used in this study were identified as a unique factor, this scale might be improved with the addition of other items. Potential items could include: (1) I cannot afford to take my land out of production, (2) my knowledge and skills cannot be easily applied to a career outside farming/ranching, or (3) I am counting on the future value and productivity of my land to support me in retirement. These items capture two potentially different aspects; land as a person’s primary source of wealth, and farming/ranching as a person’s career of choice. Future research could more carefully examine economic place dependence for farmers and ranchers by expanding on the scale used here or examining if it has any sub-dimensions.

Despite this limitation, our findings have implications for future research and conceptualization of the dimensions of sense of place. Dependence on place first was studied among recreational land users – capturing the relationship between desired activities and traits of a place that enable those activities. Rather than focusing on how traits of a place enable recreational activity, this research documented another form of place dependence – the economic opportunities places afford to people. The implications for future research are numerous. First, under what conditions does economic dependence limit support for conservation and preservation

activities? This could be studied among urban and rural residents and property owners in relation to a variety of programs that put restrictions on personal property rights (e.g. historic conservation districts, wild and scenic river designation, and scenic highway designation). Second, what types of landowners experience economic dependence on their property and how does it differ in cities versus rural areas? Third, what is the function of scale of place in creating a sense of economic dependence? Does economic dependence to a large place like a city differ from economic dependence to a small place like one's personal property or neighborhood? The concept of economic dependence as a dimension of sense of place could be expanded through comparative studies. Future researchers might examine groups of people who rate similarly on dimensions of sense of place (e.g. those who rate high on conservation ethic but low on economic dependence as compared to those who rate high on both) and examine differences in attitudes and behaviors between those groups.

Additionally, we found that attitudes towards land trusts and adoption of conservation easements were significantly higher in Colorado than in Wyoming. This raises the question, what role do policies and political ideologies play in the conservation equation? There are two notable policy differences between Colorado and Wyoming. First, Wyoming passed legislation regarding conservation easements a relatively short time ago compared to Colorado. Second, Colorado has a tradeable tax benefit associated with entering into easements while Wyoming does not. Future studies might examine the influence of different types of policies on types of conservation programs and rates of adoption, which would require a multi-state comparison. Further comparisons of Colorado and Wyoming might offer the chance to examine differences in political attitudes and how they act as motivators or barriers to participation in conservation programs. Finally, extending a study like this to a geographically broader sample might be especially worthwhile, as we would suspect that regional differences in landform, economy, culture, and state policies might condition the results.

Acknowledgements

The authors would like to express appreciation to our sponsor, USDA-NRI, for funding our project: Grant# 2005-35401-16008; NASS for assistance with survey administration; and our colleague, Dr. Don McLeod, for his contributions to the larger research project and comments on this manuscript.

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