



Perpetual conservation easements and landowners: Evaluating easement knowledge, satisfaction and partner organization relationships



Dianne A. Stroman^{*}, Urs P. Kreuter

Department of Ecosystem Science and Management, Texas A&M University, 203B Animal Industries Building, 2138 TAMU, College Station, TX 77843-2138, USA

ARTICLE INFO

Article history:

Received 8 October 2013

Received in revised form

5 August 2014

Accepted 8 August 2014

Available online 2 September 2014

Keywords:

Conservation easements

Conservation values

Land trusts

Private lands conservation

Private landowners

Property rights

ABSTRACT

Conservation easements are being more widely used to facilitate permanent land conservation. While landowners who initially place a conservation easement on their land are generally highly motivated to protect the conservation values of their land, changes in landownership may hinder long-term active landowner support for these easements. Maintaining such support is critical for ensuring their effectiveness as a conservation tool. Our research reports on results from a mail survey sent to landowners in Texas who own property encumbered with perpetual conservation easements. They were asked about their level of satisfaction concerning their conservation easement and the relationship with their easement holder. Additionally, landowners were asked how well they remembered and understood the terms of their conservation easement. We also examined institutional aspects of easement holding organizations and variables associated with landownership that affected these attitudes. Among institutional factors, frequency of contact between landowners and easement holders and the category of agency (federal, state and local or non-governmental agency) were significant in determining level of satisfaction with the easement and perceived relationship with the easement holder. Landowner factors affecting these same issues included easement grantor or successive generation landowner, gender and motivations driving landownership. We did not find any significant variables related to landowners' knowledge about their easement. Management implications from this study suggest that easement holders should increase staff capacity capable of providing targeted landowner technical assistance and outreach beyond compliance monitoring. Additionally, landownership motivations should be considered by easement holders when deciding whether to accept an easement. Finally, expressed dissatisfaction with federal governmental easement holding institutions should be explored further.

© 2014 Elsevier Ltd. All rights reserved.

1. Introduction

Effective conservation of natural resources on private lands is critical throughout the United States (U.S.) because private property is the dominant form of landownership and many ecosystem services needed for the well-being of current and future generations are derived from them. Even in states that have large swaths of public land, private lands provide many important ecosystem services, including high value targets, such as endangered species habitats (Wilcove et al., 1996). Conservation easements have evolved to become a leading tool for implementing long-term

conservation on privately owned rural lands in the U.S., especially for protecting biodiversity (Merenlender et al., 2004; Rissman et al., 2007). By 2010, approximately 8.8 million acres in the U.S. were protected under easements held by non-governmental organizations (NGO's), up from just 2.3 million acres in 2000 (Chang, 2011). This does not include an estimated 12 million acres of easements held by federal, state and local governmental agencies (Pidot, 2005). Furthermore easements, as a land protection mechanism are increasingly used internationally throughout North America, New Zealand, Australia, Europe and Latin America (Saunders, 1996; Kabii and Horwitz, 2006; Rissman et al., 2007; Adams and Moon, 2013).

Previous research on conservation easements has examined the spatial distribution patterns of conserved lands and the types of development allowed on easement properties (Merenlender et al.,

^{*} Corresponding author.

E-mail address: dstroman@neo.tamu.edu (D.A. Stroman).

2004; Kiesecker et al., 2007; Rissman et al., 2007). In addition, numerous publications offer prescriptive guidance for establishing and negotiating conservation easements (Gustanski and Squires, 2000; Byers and Ponte, 2005; Lindstrom, 2008). However, only within the last decade have there been any substantial attempts to empirically evaluate the ecological efficacy of perpetual conservation easements and minimal research has been conducted to determine the social implications of establishing them (Kabii and Horwitz, 2006; Wallace et al., 2008; Pocewicz et al., 2011; Alexander and Hess, 2012; Rissman and Sayre, 2012).

While some studies have included landowners whose property was encumbered with perpetual conservation easements, limited research has specifically targeted such landowners to obtain a clear understanding of factors affecting landowner perspectives about their easements. In 1997, Feinberg and Luzadis (1997) conducted a survey of landowners in the Northeast U.S. whose conservation easements were held by four non-profit organizations and one state agency. They found that, in general, landowners who conveyed the easement (i.e. grantor landowners) were highly satisfied with their easement and were not motivated to grant it primarily for financial reasons. They also concluded that successive generation landowners were satisfied with their knowledge of easement restrictions but expressed a desire for more ongoing contact with their easement holding organization. Furthermore, they reported that 37% of successive generation easement landowners would, given the option, amend their easement, compared with just 19% of grantor landowners (Feinberg and Luzadis, 1997). Rilla (2002), who interviewed 47 conservation easement landowners in California, found that their primary motivations for selling an easement were land preservation and economic considerations. Farmer et al. (2011), reporting on the results of a mail survey of 187 Midwestern easement landowners, specifically examined landowner motivations driving easement conveyance. They found that place attachment and “contributing to the public good” both appeared to be strong drivers for landowners granting an easement, while financial incentives were the lowest ranked motivational factor.

In our study we look beyond motivational factors associated with easement conveyance. While conveyance of easements may be a necessary first step for protecting land from fragmentation and development, this is inadequate to ensure long-term maintenance of the ecosystem processes needed to meet the conservation goals of perpetual easements. To address the limitations of previous work and to contribute to theory regarding effective long-term conservation of private land encumbered by conservation easements, our research addresses the following question: *What factors are likely to enhance the future effectiveness of easements?* To answer this question we report findings about landowner responses regarding their *knowledge* about and *satisfaction* with their conservation easement as well as the *relationship* that they have with the easement holding organization.

We do this by postulating the following hypotheses: *Easement Knowledge* – [H1] Level of landowners' *knowledge* about the terms of their easement decreases with time since conveyance of the easement; and [H2] Landowners who originally granted the conservation easement (grantor landowners) are more *knowledgeable* about their easement than landowners who did not grant the easement (successive landowners). *Satisfaction* – [H3] Level of *satisfaction* of landowners with their easement is negatively correlated with the time since the easement was conveyed; [H4] Easement grantor landowners are more *satisfied* with their easement than successive generation landowners; [H5] Landowners who use their land to generate income through farming, ranching or mineral extraction or who own it as a financial investment are less *satisfied* with their easement and their relationship with their easement holder than landowners who use their land mainly for

recreational purposes; and [H6] Landowners who live on their land are less tolerant of conservation easement-related land use restrictions and, therefore, are less likely to be *satisfied* with their easement than absentee landowners. *Relationship with easement holding entity* – [H7] Landowners' perceived *relationship* with their easement holding institutions is positively associated with the frequency of contact (social exchange) between them (Cropanzano and Mitchell, 2005; Cross et al., 2011); and [H8] Landowners' easement satisfaction and *relationship* with their easement-holder is better when the easement holding institutions are private non-profit organizations (e.g., land trusts), than if they are public entities (i.e., local state or federal agencies). Because most public easement programs are purchased, rather than donated easements, we expect that the financial consideration provided will not provide long-term satisfaction. Conversely, most private easement holding organizations rely on donated easements, where the potential goal conflict between landowners and easement holders may be lower (Rissman and Sayre, 2012).

2. Methods

2.1. Study area and survey sample

The study consisted of all landowners in Texas whose property was encumbered with a permanent conservation easement in 2010. Texas, a very large (696,241 km²), centrally-located state shares cultural and ecological commonalities with eastern, central and western portions of the United States and northern Mexico (Fig. 1). Furthermore, it has diverse land use patterns.

To develop the easement landowner database, we contacted all private and public easement-holding institutions in Texas. Ultimately we included 518 easement landowners associated with 33 easement-holding organizations. Sixteen entities provided contact information for 429 landowners. Sixteen other easement holders declined to provide the landowner contact lists but, using public county records, we were able to obtain contact information for 69 landowners with conservation easements who were associated with these organizations. Finally, one NGO, representing 20 landowners, did not wish to provide member contact information but instead participated in the study by concurrently mailing survey items directly to its members. Some organizations indicated that specific landowners did not wish to be included in our study and, accordingly, they were excluded from the study sample.

2.2. Mail survey

A mail survey questionnaire was developed based on a literature review and in consultation with key informants from easement-holding organizations and some landowners. The questionnaire was tested and refined through informal focus group meetings consisting of land conservation professionals and conservation easement landowners. The mail survey questionnaire included 78 questions addressing four areas of inquiry: private property rights and responsibilities, land management activities on easement properties, easement-specific issues, and landowner demographics. The survey was initiated in September 2011. It was administered using a five-phase mailing protocol (Dillman, 2000). This protocol consisted of: day 1 – pre-survey notification letter informing the participants about the study and indicating the value to them of participating in it; day 7 – survey questionnaire with cover letter and a postage-paid return envelope; day 14 – reminder/thank you postcard; day 28 – replacement questionnaire with cover letter and another return envelope to non-respondents; and day 42 – final reminder/thank you postcard. Survey responses were accepted for up to four months from the date of the first mailing of the survey. An

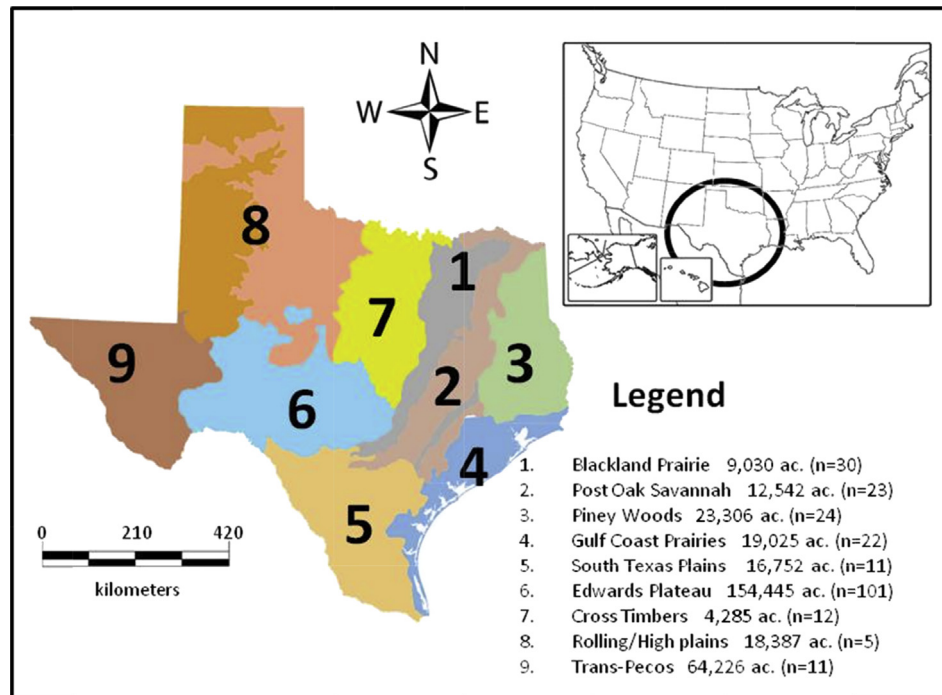


Fig. 1. Map of study area. Acreage under easement reported by survey respondents (n) by Gould ecoregion (Gould et al., 1960). Rolling Plains and High Plains were combined due to substantial overlap of easement properties between ecoregions.

abbreviated questionnaire including a limited number of attitudinal and demographic indicator questions was mailed in March, 2012 to all survey non-respondents to test for non-response bias.

2.3. Data analysis

Survey data were entered into a Microsoft Excel spreadsheet and analyzed using STATA 12.0 (StataCorp, 2011). Statistical analyses included descriptive statistics for demographic data, t -tests for non-response bias testing, principle components analysis (PCA) for variable reduction, and multivariate ordinal logistic regression modeling and analysis for hypothesis testing. Multivariate ordinal logistic regression models were used to analyze the relationship between three dependent variables and several independent variables. The dependent variables were related to (1) landowner knowledge of and (2) satisfaction with their conservation easement and (3) the landowner relationship with their easement holding organization. Ordinal logistic regression was used because the dependent variables were quantified using seven point Likert-type response scales and this approach avoids the assumption that the distances between response options are equal (Long and Freese, 2006). Participants were also given the opportunity to include additional comments at the end of the survey, some of which were used for discussion purposes.

3. Results

Of the 518 identified survey participants, we received 18 returns due to incorrect addresses resulting in an effective survey sample size was 500. Of the surveys distributed, we received 273 responses, 251 of which included completed survey questionnaires and 22 indicating respondents did not wish to participate. This translates into a 50% useable response rate. Of the 227 abridged questionnaires sent to the non-respondents, 47 completed questionnaires were received, representing 21% of the non-response

pool and 9% of the total survey sample. Analysis of the abbreviated non-respondents survey did not find any statistically significant differences between survey participants and non-participants.

3.1. Respondent profiles

The survey respondents were predominantly male (83%), their average age was 62 years ($SD = 11.19$, range = 35–88 years), and their formal education averaged 16.4 years ($SD = 3.16$, range = 5–27 years). Eighty-two percent of the respondents had granted the original easement, 36% of the respondents resided full-time on their conservation easement property, 19% were weekend residents and 45% were absentee landowners. In combination, the survey respondents held 328,148 total acres under easement. The size of easement properties ranged from 5 to 30,000 acres, with a median of 350 acres. The average period of property ownership also ranged widely from one to 165 years, with 38 respondents (15%) reporting that the property had been in their family for 100 years or more, and the median ownership period being 12 years. Of the respondents, 61% reported earning no income from their easement-encumbered property, 34% reported earning up to 25% of their income from it, and only 5% reported earning more than 25% of their income from it. This indicates that, in general, landowners with easement-encumbered properties do not rely substantially on that property for income generation.

The survey responses included easements held by 26 of the 33 easement-holding organizations in Texas. The seven easement holders not represented in our survey responses were all small organizations that collectively hold approximately 13 easements. Responses included easements located throughout the study area (Fig. 1). The Edwards Plateau ecoregion produced the highest number of responses ($n = 101$) and while the Trans-Pecos ecoregion only produced 11 respondents, it had the second largest acreage total. This is likely due to the larger average land parcel size in that region (Wilkins et al., 2009).

3.2. Regression model development

In order to reduce the number of both dependant and explanatory variables and simplify our regression models, we conducted a principal components analysis (PCA) with varimax rotation for two sets of survey items: 1. Issues relating to conservation easements; and 2. Reasons for owning the land. PCA identifies variables that exhibit high collinearity allowing interrelated variables to be combined into additive indices or factors (Treiman, 2009). After the initial PCA analysis, orthogonal varimax rotation was applied to create indices without inter-correlated components. Finally, Cronbach's alpha coefficients were derived to assess the internal consistency of a summative rating scale composed of the specified variables. Scales with Cronbach's $\alpha > 0.70$ are generally considered acceptable for social science research purposes (UCLA Academic Technology Services, 2004).

PCA results from the section of the survey asking landowners specific questions about their conservation easements yielded two distinct factors (Table 1).

Factor I represents landowners' self-reported knowledge about their easement and factor II represents landowners' expressed satisfaction with their easement. A third variable from the same section of the survey is a stand alone variable representing the landowners opinion about the relationship between the landowner and the easement holder. These three variables were used as dependent variables in the regression models.

We also conducted a PCA analysis for 14 variables related to reasons for landownership. In this set of survey questions, landowners were asked to rate the importance of a variety of reasons for owning their easement property including: financial investment, generating a profit from the land, selling the land for profit, farming/ranching, hay/forage production, livestock production, crop cultivation, outdoor enjoyment, relaxation, non-consumptive recreation, recreational hunting/fishing, commercial hunting, wildlife management or mineral extraction. For the landownership section, PCA yielded three factors with an acceptable Cronbach's alpha score which were used as independent variables in our regression models: farmer/rancher ($\alpha = 0.8220$), recreation ($\alpha = 0.7181$) and investment ($\alpha = 0.7495$). These three factors were included as independent variables in some of our regression models. A fourth factor, composed of variables related to hunting and fishing was deemed unreliable due to a low Cronbach's alpha score ($\alpha = 0.4414$).

In addition to the PCA indices, Table 2 includes a descriptive list of all of the independent variables used in the regression models.

Table 1

Rotated factor loading results of PCA analysis on conservation easement (CE) specific issues with Cronbach's α of internal reliability. (Factor I = knowledge, Factor II = satisfaction). The shaded values indicate which variables load on a specific factor.

Variable	Factor I knowledge ($\alpha = 0.7932$)	Factor II satisfaction ($\alpha = 0.8287$)
I remember my CE	0.8243	0.2417
I understand my CE	0.8882	0.2091
I know who to contact about my CE	0.7228	0.1167
I would grant additional CE's	0.143	0.8636
I am happy to comply with the CE	0.321	0.7605
I would not terminate my CE	0.170	0.8779

3.3. Regression results

Table 3 presents the results of the three regression models analyzing landowners' easement knowledge and their reported satisfaction with their easement and their easement holding organization.

We hypothesized that landowners who originally conveyed their easement were more *knowledgeable* about the terms of their easement than successive landowners and that this knowledge declined with time since easement conveyance [H1 and H2]. Our study failed to corroborate either of these hypotheses. Rather, we found the only factor that seemed to influence knowledge about the easement was gender; female respondents were more likely to report that they were familiar with the terms of their easement. However, we should note that the easement knowledge questions simply asked landowners how well they felt that they remembered and understood their easement and if they knew who to contact if they had questions about their easement. Our survey did not have a mechanism to determine if they were correct in their self-assessment. Furthermore, the easement knowledge regression

Table 2

List of explanatory variables used in regression analysis models.

Variable labels	Variable descriptions
Landownership characteristics	
Age in 2011	Landowners age in 2011. Continuous single item variable
Gender	Binary single item variable; 1 = male, 0 = female
Years of education	Landowners number of years of education. Continuous single item variable
Age of conservation easement	Number of years since easement conveyance. Continuous single item variable
Grantor landowner	Landowner granted the easement. Binary single item variable; 1 = yes, 0 = no
Income from CE = 1–25% ^a	Percentage of annual income derived from easement property. Binary single item variable
Income from CE > 25% ^a	Percentage of annual income derived from easement property. Binary single item variable
Weekend resident	Binary single item variable; full-time resident is reference category
Absentee landowner	Binary single item variable; full-time resident is reference category
Farmer/rancher landowner	PCA index variable representing farming and/or ranching as primary reason for CE landownership
Recreation landowner	PCA index variable representing recreation as primary reason for CE landownership
Investment landowner	PCA index variable representing financial investment as primary reason for CE landownership
Institutional characteristics	
fedgovt ^b	Easement holder is a federal government agency
Statelocalgovt ^b	Easement holder is a state or local government agency in Texas
Interact never ^c	Frequency of interaction between landowner and easement holder (never)
Interact < once per year ^c	Frequency of interaction between landowner and easement holder (less than once per year)
Interact once per year ^c	Frequency of interaction between landowner and easement holder (once per year)
Never accompany staff visits ^d	Landowner accompanies easement holder staff on monitoring visits (no)
Sometimes accompany staff visits ^d	Landowner accompanies easement holder staff on monitoring visits (sometimes)

^a Income from CE (conservation easement) = 0% used as reference category.

^b NGO is reference category.

^c Interact > once per year (more than one interaction per year between landowner and easement holder) used as reference group.

^d Always accompany staff on visits (landowner always accompanies easement holder staff on monitoring visits) used as reference group.

Table 3
Results of ordinal logistic regression analysis for conservation easement (CE)-dependent variables including knowledge of and satisfaction with conservation easement and relationship with the easement holder. (Highlighted results are statistically significant at $P < 0.05$; † results significant at $P < 0.10$).

Independent Variables	Knowledge			Satisfaction			Relationship		
	model $P = 0.117$			model $P < 0.001$			model $P < 0.001$		
	β coeff.	p-value	% Δ odds	β coeff.	p-value	% Δ odds	β coeff.	p-value	% Δ odds
Age of CE	0.036	0.204	3.7	-0.035	0.200	-3.5	-0.081	0.011	-7.8
Grantor landowner	-0.375	0.422	-31.300	1.509	0.002	352.4	1.258	0.007	251.9
CEI = 1–25% ^a	-0.57	0.112	-43.5	-0.245	0.469	-21.8	-1.087	0.007	-66.3
CEI > 25% ^a	-0.164	0.841	-15.200	0.150	0.853	16.2	-1.296	0.115	-72.6
Weekend resident ^b	0.468	0.291	59.800	0.431	0.331	53.9	0.255	0.600	29.2
Absentee landowner ^b	0.522	0.126	68.500	0.386	0.266	47.2	0.632	0.105	88.3
Farmer/rancher owner	0.155	0.411	16.800	-0.144	0.431	-13.4	-0.018	0.931	-1.8
Recreation landowner	0.130	0.411	13.900	0.486	0.004	62.6	0.344	0.032	41.1
Investment landowner	-0.179	0.258	-16.300	-0.582	0.000	-44.1	-0.420	0.014	-34.3
Years education	0.003	0.946	0.300	0.025	0.584	2.5	-0.040	0.446	-4.0
Gender	-0.972	0.019	-62.200	-0.787	0.058	-54.5 [†]	-1.266	0.021	-71.8
Age in 2011	-0.020	0.152	-1.900	0.030	0.022	3.0	0.002	0.888	0.2
Federal government ^c	-0.182	0.535	-16.7	-1.599	0.000	-79.8	-1.378	0.000	-74.8
State or local government ^c	0.077	0.820	8.000	0.384	0.258	46.8	-0.251	0.468	-22.2
Interact never ^d	1.037	0.409	182.3	-2.608	0.065	-92.6 [†]	-2.917	0.011	-94.6
Interact < once per year ^d	-1.258	0.105	-71.600	0.840	0.242	131.8	-2.322	0.003	-90.2
Interact once per year ^d	-0.209	0.413	-18.900	-0.928	0.000	-60.5	-1.057	0.000	-65.3
Never accompany staff visits ^e	-0.046	0.903	-4.600	-0.368	0.373	-30.8	-0.503	0.224	-39.6
Sometimes accompany staff visits ^e	-0.382	0.154	-31.800	-0.214	-0.422	-19.3	-0.391	0.187	-32.4

^a Income from conservation easement (CEI) = 0% is reference category.

^b Full time resident is reference category.

^c NGO is reference category.

^d Interact > once per year is reference category.

^e Always accompany staff visits is reference category.

model itself was not significant ($P = 0.117$) making any inferences drawn from the findings moot.

The *satisfaction* and *relationship* models showed similar explanatory patterns. Results from both models indicate that landowners who initially granted the conservation easement (grantors) were 3.5 times more likely to report satisfaction with their easement and 2.5 times more likely to report having a good relationship with their easement holder than successive landowners. These findings support our hypothesis [H4] that grantor landowners are more satisfied with their easement than successive landowners. Our hypothesis that satisfaction with the easement would decrease over time [H3] was not substantiated. Landowners primary land use [H5] was significant, but only for investment landowners and recreational landowners. Those who own their easement property primarily for recreational purposes expressed significantly more satisfaction (62% more likely to report easement satisfaction) with their easement than landowners who own their land for other purposes. By contrast, landowners who own their property primarily as a financial investment were 44% less likely to be satisfied with their conservation easement than landowners who owned the property for other purposes. Similarly, recreational landowners were 41% more likely and investment landowners were 34% less likely to report having a good relationship with their easement holders than landowners who owned their property primarily for other reasons. Contrary to our assumptions, whether or not the landowner lived on the easement property [H6] did not impact their easement satisfaction.

Interaction frequency [H7] was also found to be a significant factor for explaining differences in both the satisfaction and relationship models. Landowners who interacted with their easement holder once per year or less were generally more dissatisfied with the easement and their relationship with their holder organization than those who interacted with their easement holding organization more frequently. The models indicate that as the frequency of

interaction increased, landowner dissatisfaction with their easement decreased. In other words, increased contact between landowners and easement holders seems to increase landowner's satisfaction with both their easement and with their easement holder. In addition, the categories of easement holder [H8] were significant both in terms of landowner satisfaction with the easement and the relationship with the easement holder. Landowners whose easement was held by a federal agency were 79% more likely to express dissatisfaction with the easement itself and 74% more likely to express dissatisfaction with their relationship with their easement holder than landowners whose easement was held by an NGO. Landowners with easements held by a state or local governmental agency were not statistically different from NGO-partnered landowners either with respect to easement satisfaction or relationship with their easement holder. Landowner age and gender were additional factors predictive of easement satisfaction, with older landowners and women being significantly more likely to convey overall satisfaction with their easements.

Additional explanatory variables not captured in the satisfaction models but significant in the relationship model included the age of the easement (or number of years since easement conveyance) and landowners who derive 25% or less of their annual income from their easement property. Based on our study, landowners' relationship with their easement holder declines over time and landowners who derive 25% or less of their annual income from their easement property are less likely than those who derive no income from their land to report having a good relationship with their easement holder.

4. Discussion

Based on previous research and other rationale, we hypothesized that a number of landowner characteristics and easement holder factors would influence landowners' knowledge about and

satisfaction with their easement and their relationship with the easement holder. We found scant evidence of factors affecting landowners' knowledge of their conservation easement. However, we uncovered overlapping influences relating to landowner satisfaction with their easement and the relationship with their easement holder. Specifically, our research corroborated that (1) ownership for recreation, (2) grantor versus successive landowner, (3) increased institutional contact and (4) institutional type significantly influence landowners' satisfaction with their easement and landowners' perceived relationship with their easement holder. Each of these factors is discussed below.

(1) In both the satisfaction and relationship models, landowners who owned their property primarily for recreational purposes were happier with their conservation easement than landowners who own their property primarily for other purposes, particularly if the property was owned primarily for financial investment purposes. This may be attributable to the fact recreational owners are less likely to be inconvenienced by development or land subdivision restrictions than other landowner groups. Easement restrictions tend to impact recreational uses less decreasing the potential for conflict on recreational properties (Rissman et al., 2007). This argument is bolstered by the corresponding negative satisfaction with easements reported by landowners who owned their property primarily for investment purposes. In addition to use restrictions, based on some of the comments from survey respondents, we suspect that actual or perceived reductions in the value of easement properties are contributing to these observed attitudes.

(2) The grantor versus successive landowner effect was a statistically significant explanatory variable in both the satisfaction and relationship models. Many conservation practitioners working with easements have long suspected that successive generation landowners may harbor negative attitudes about their easements (Feinberg and Luzadis, 1997; Pidot, 2005). Our research provides empirical evidence that supports those concerns; we identified that successive generation landowners are significantly less satisfied than the initial grantors with the easement and their relationship with their easement holder. This may have implications for future investments in land management improvements because previous research demonstrates that landowner satisfaction is positively correlated with pro-environmental behaviors (Lopez-Mosquera and Sanchez, 2011; Ramkissoon et al., 2013). Within the context of perpetual conservation easements, the number of major legal challenges and violations of easements have been increasing with the majority of those challenges involving landowners who did not convey the easement (Rissman and Butsic, 2011). Some land trusts are developing strategies to deal with the financial costs of future legal challenges, such as the Land Trust Alliances' TerraFirma conservation easement defense insurance program (Land Trust Alliance, 2009).

While this is an important step, conservation easement holding organizations also need to address the potential social consequences of increasing easement challenges. Increasing conflicts over easements could serve to undermine the viability of easement programs everywhere. While initial education and outreach between successive generation easement landowners and easement holders is important, maintaining relationships with all easement landowners will require persistent, sustained efforts (Rissman, 2013). Easement holding organizations should develop staff capacity specifically focused on cultivating ongoing relationships between themselves and their landowner partners beyond the traditional role of easement monitoring and enforcement. As one respondent commented, "the conservation easement representative for my program has done a very poor job of building a relationship with me. Our (group) has occasional meetings where they (the easement holder) could join in and build relationships with

our 'community'. They are missing an educational opportunity to encourage new and proven tools for us to use as a group."

Developing social capital-fostering programs that specifically target private landowners is one strategy that has been successful in other contexts. Easement holding organizations could use landowner-driven social capital models that have proven successful in promoting collaboration and land management in other contexts, such as is seen with wildlife management associations (WMA's) (Wagner et al., 2007) or prescribed burn associations (PBA's) (Toledo et al., 2012; Twidwell et al., 2013). These types of social capital models rely on peer to peer learning and cooperation rather than the more traditional one direction educational delivery model (Kueper et al., 2013). Many NGO's, in particular, have both the experience and capacity to create or support collaborative landowner networks. Extensive research has shown the benefits of promoting landowner associations in enhancing ecological functions, promoting ongoing active management and fostering social bonding all of which potentially increase the ecological efficacy of conservation easements over the long term (Wagner et al., 2007; Lai and Kreuter, 2012; Toledo et al., 2012; Kueper et al., 2013).

(3) Our research demonstrates a clear relationship between frequency of contact between landowners and easement holders and landowners' level of satisfaction with their easements. In addition, while many landowners viewed the relationship with their easement holder to be positive, as one landowner stated, "the personnel and philosophy of the conservation holding organization are critical [to this relationship]". Strong relationships between easement holders and landowners are likely to increase the effectiveness of on the ground conservation on easement properties, whereas weak relationships may lead to a decline in the maintenance of conservation practices. Given these findings, easement holders should incorporate capacity needs into their easement program planning and carefully consider their ability to cultivate and sustain working relations with their landowner partners before accepting easements. Increasing access to technical guidance and funding opportunities provides an on-going tangible benefit to both grantor and successive generation landowners. However, this potential communication is not a one way street. Many landowners are effective educators and natural leaders who are capable of providing easement holder staff with local knowledge of natural resource and land use history as well as land management skills that may enhance the success of conservation endeavors. Furthermore, happy easement landowners are more likely to encourage their neighbors to convey easements. Leveraging positive landowner-easement holder relationships with strong landowner networks may provide opportunities to increase collaborative management over larger geographic scales (Rissman and Sayre, 2012). For example, one group of nine landowners in our study had all placed easements on their adjacent properties in order to protect a river segment. Previous research has highlighted the need for planning land conservation programs in a way that creates large, contiguous protected landscapes (Stoms et al., 2009). While this makes ecological sense, it also makes sense from the standpoint of managing landowner relations. Easement holders are more likely to develop and maintain social networks with their partner landowners and provide technical assistance necessary for effective land management within local, connected easement programs (Rissman and Sayre, 2012). In areas where there are active, spatially focused easement programs, connecting existing easements with new easements is critical for achieving landscape scale successes.

Additionally, the role of women in easement programs should be explored further. Women tend to exhibit more pro-environmental behaviors than men (Zelezny et al., 2000; Dietz et al., 2002). Our research found that women were more satisfied with their easement and the relationships with their easement

holders than men, a finding that suggests easement holders should tailor some of their outreach efforts specifically towards women.

(4) Whether or not the easement holding organization was a federal agency or not proved to be a strong predictor of landowner dissatisfaction with both their easement and their relationship with their easement holder. While federal agency easement holding organizations in Texas include both the U.S. Fish and Wildlife Service (USFWS) and the Natural Resources Conservation Service (NRCS), the preponderance of respondents included in this category (54 out of 59 respondents) had easements held by the NRCS. The NRCS is one of the top permanent easement holders in the United States, holding perpetual easements as part of the Wetland Reserve Program (WRP) and Grassland Reserve Program (GRP). Several landowners associated with a federal easement holder voiced frustration with bureaucratic hurdles required for making management decisions on their easement property. One common theme expressed in the comments section of the survey revolved around the lack of flexibility for conducting land management activities on easement lands. For example, on NRCS easements in Texas, landowners who wish to conduct any management activities on their easement property must submit a compatible use agreement each year, which is subject to approval by the state NRCS office. Two respondents' comments clearly demonstrate such sentiments:

“As with the government, there is way too much red tape. You have to get approval and permission for even the simplest of activities.”

“The local (federal agency) guys are great to deal with and share common sense ideas on compatible management practices, but nothing can get through the (agency's local office) bureaucracy ...”

Allowing more decentralized decision making to occur at the local level by permitting landowners to obtain approval for management activities through local NRCS biologists would allow management decisions to be made based on actual site conditions. Allowing local staff to approve management decisions would also facilitate a more timely decision making process that would be more responsive to changing local conditions. The frustration expressed in our study with federal governmental agencies suggests that more research is needed to explain the root causes and potential remedies for mitigating potential landowner conflicts over easements.

5. Conclusions

The use of conservation easements for mitigating threats to biodiversity is fast becoming a leading incentive-based land conservation tool. In conjunction with research demonstrating the ecological effectiveness of easement protections, theoretical research expanding on environmental attitudes concerning conservation easements is necessary for a comprehensive understanding of this protection mechanism. While easement conveyance may prevent some types of ecological damage, chiefly habitat fragmentation and infrastructure development, ongoing land management will be required to maintain conservation targets. Easement landowners will bear the bulk of this responsibility but easement holders have the opportunity and responsibility to influence management decisions on easement protected landscapes. However, if the underlying social relations between landowners and easement holders become confrontational rather than collaborative, it has the potential to undermine the value and effectiveness of conservation easements as a legitimate tool for conserving private lands.

Our study contributes to the body of knowledge on the efficacy of long-term conservation programs by highlighting social factors that may reinforce or undermine protections. Given the widespread application of perpetual conservation easements both in the U.S. and abroad and the cultural and ecological diversity represented in our study sample, the findings presented in this study provide a barometer of current landowner attitudes concerning perpetual conservation easements. Furthermore, many of the factors identified in this research as impacting landowner easement satisfaction and social relations between landowners and easement holders pertain to easement programs everywhere. Key insights from this study provide several important management implications including the need for: 1) increasing easement holder capacity to manage landowner relations and outreach, 2) comprehensive planning focused on creating contiguous easement programs, 3) incorporating adaptive management plan capabilities within easements and 4) connecting easement landowners with peer-to-peer social network natural resource management groups.

Acknowledgements

We would like to thank The Nature Conservancy of Texas for providing funding for the mail surveys. We are grateful to all of the land trusts and public agencies that assisted us by providing contact information for our survey participants and to the landowners who participated in this study. Additionally, thanks to several anonymous reviewers who provided valuable comments on earlier drafts of this manuscript. D. Stroman is supported by a USDA National Needs fellowship.

References

- Adams, V.M., Moon, K., 2013. Security and equity of conservation covenants: contradictions of private protected area policies in Australia. *Land Use Policy* 30, 114–119.
- Alexander, L., Hess, G.R., 2012. Land trust evaluation of progress toward conservation goals (Evaluación de Fideicomiso de Tierras del Progreso hacia Metas de Conservación). *Conserv. Biol.* 26, 7–12.
- Byers, E., Ponte, K.M., 2005. *Conservation Easement Handbook*. Island Press, Washington D.C.
- Chang, K., 2011. 2010 National Land Trust Census Report. Land Trust Alliance, Washington, D.C.
- Cropanzano, R., Mitchell, M., 2005. Social exchange theory: an interdisciplinary review. *J. Manag.* 31, 874–900.
- Cross, J.E., Keske, C.M., Lacy, M.G., Hoag, D.L.K., Bastian, C.T., 2011. Adoption of conservation easements among agricultural landowners in Colorado and Wyoming: the role of economic dependence and sense of place. *Landsc. Urban Plan.* 101, 75–83.
- Dietz, T., Kalof, L., Stern, P.C., 2002. Gender, values, and environmentalism. *Soc. Sci. Q.* 83, 353–364.
- Dillman, D.A., 2000. *Mail and Internet Surveys: the Tailored Design Method*. John Wiley and Sons, New York, NY.
- Farmer, J.R., Knapp, D., Meretsky, V.J., Chancellor, C., Fischer, B.C., 2011. Motivations influencing the adoption of conservation easements. *Conserv. Biol.* 25, 827–834.
- Feinberg, P.B., Luzadis, V.A., 1997. *An Evaluation of Landowner Satisfaction with Conservation Restrictions*. SUNY-ESF, Syracuse, SUNY.
- Gould, F.W., Hoffman, G.O., Rechenhain, C.A., 1960. *Vegetational Areas of Texas*. T. A. M. University, Texas Agricultural Experiment Station. Leaflet No. 492.
- Gustanski, J.A., Squires, R., 2000. *Protecting the Land: Conservation Easements, Past, Present and Future*. Island Press, Washington D.C.
- Kabii, T., Horwitz, P., 2006. A review of landowner motivations and determinants for participation in conservation covenanting programmes. *Environ. Conserv.* 33, 11–20.
- Kiesecker, J.M., Comendant, T., Grandmason, T., Gray, E., Hall, C., Hilsenbeck, R., Kareiva, P., Lozier, L., Naehu, P., Rissman, A., Shaw, M.R., Zankel, M., 2007. Conservation easements in context: a quantitative analysis of their use by the nature conservancy. *Front. Ecol. Environ.* 5, 125–130.
- Kueper, A.M., Sagor, E.S., Becker, D.R., 2013. Learning from landowners: examining the role of peer exchange in private landowner outreach through landowner networks. *Soc. Nat. Resour.* 26, 912–930.
- Lai, P.-H., Kreuter, U.P., 2012. Examining the direct and indirect effects of environmental change and place attachment on land management decisions in the Hill Country of Texas, USA. *Landsc. Urban Plan.* 104, 320–328.

- Land Trust Alliance, 2009. Exploring Conservation Defense Insurance: Considerations for Board Members. Washington, DC.
- Lindstrom, T.C., 2008. *A Tax Guide to Conservation Easements*. Island Press, Washington D.C.
- Long, J.S., Freese, J., 2006. *Regression Models for Categorical Dependent Variables Using Stata*. Stata Press, College Station, TX.
- Lopez-Mosquera, N., Sanchez, M., 2011. Emotional and satisfaction benefits to visitors as explanatory factors in the monetary evaluation of environmental goods. An application to periurban green spaces. *Land Use Policy* 28, 151–166.
- Merenlender, A.M., Huntsinger, L., Guthey, G., Fairfax, S.K., 2004. Land trusts and conservation easements: who is conserving what for whom? *Conserv. Biol.* 18, 65–76.
- Pidot, J., 2005. *Reinventing Conservation Easements: a Critical Examination and Ideas for Reform*. Lincoln Institute of Land Policy.
- Pocewicz, A., Kiesecker, J.M., Jones, G.P., Copeland, H.E., Daline, J., Meador, B.A., 2011. Effectiveness of conservation easements for reducing development and maintaining biodiversity in sagebrush ecosystems. *Biol. Conserv.* 144, 567–574.
- Ramkissoon, H., Smith, L.D.G., Weiler, B., 2013. Relationships between place attachment, place satisfaction and pro-environmental behavior in an Australian national park. *J. Sustain. Tour.* 21, 434–457.
- Rilla, E., 2002. Landowners, while Pleased with Agricultural Easements, Suggest Improvements. *California Agriculture* 56.
- Rissman, A., Sayre, N.F., 2012. Conservation outcomes and social relations: a comparative study of private Ranchland conservation easements. *Soc. Nat. Resour.* 25, 523–538.
- Rissman, A.R., 2013. Rethinking property rights: comparative analysis of conservation easements for wildlife conservation. *Environ. Conserv.* 40, 222–230.
- Rissman, A.R., Butsic, V., 2011. Land trust defense and enforcement of conserved areas. *Conserv. Lett.* 4, 31–37.
- Rissman, A.R., Lozier, L., Comendant, T., Kareiva, P., Kiesecker, J.M., Shaw, M.R., Merenlender, A.M., 2007. Conservation easements: biodiversity protection and private use. *Conserv. Biol.* 21, 709–718.
- Saunders, C., 1996. Conservation covenants in New Zealand. *Land Use Policy* 13, 325–329.
- StataCorp, 2011. *Stata/SE 12.0 for Windows*. College Station.
- Stoms, D.M., Jantz, P.A., Davis, F.W., DeAngelo, G., 2009. Strategic targeting of agricultural conservation easements as a growth management tool. *Land Use Policy* 26, 1149–1161.
- Toledo, D., Kreuter, U.P., Sorice, M.G., Taylor, C.A., 2012. To burn or not to burn: ecological restoration, liability concerns and the role of prescribed burning associations. *Rangelands*, 18–23.
- Treiman, D.J., 2009. *Quantitative Data Analysis: Doing Social Research to Test Ideas*. Jossey-Bass, San Francisco, CA.
- Twidwell, D., Rogers, W.E., Fuhlendorf, S.D., Wonkka, C.L., Engle, D.M., Weir, J.R., Kreuter, U.P., Taylor, C.A., 2013. The rising Great Plains fire campaign: citizens' response to woody plant encroachment. *Front. Ecol. Environ.* 11, e64–e71.
- UCLA Academic Technology Services, 2004. *What Does Cronbach's Alpha Mean?*. <http://www.ats.ucla.edu/stat/spss/faq/alpha.html> (Retrieved November 12, 2012).
- Wagner, M.W., Kreuter, U.P., Kaiser, R.A., Wilkins, R.N., 2007. Collective action and social capital of wildlife management associations. *Hum. Dimensions Wildl.* 71, 1729–1738.
- Wallace, G.N., Theobald, D.M., Ernst, T., King, K., 2008. Assessing the ecological and social benefits of private land conservation in Colorado. *Conserv. Biol.* 22, 284–296.
- Wilcove, D.M., Bean, R.B., McMillian, M., 1996. *Rebuilding the ark: toward a More Effective Endangered Species Act for Private Land*. Environmental Defense Fund, Washington, D.C.
- Wilkins, R.N., Snelgrove, A.G., Fitzsimons, B.C., Stevener, B.M., Skow, K.L., 2009. *Texas Land Trends*. <http://texaslandtrends.org> (Retrieved June 25, 2010).
- Zelezny, L.C., Chua, P.-P., Aldrich, C., 2000. New ways of thinking about environmentalism: elaborating on gender differences in environmentalism. *J. Soc. Issues* 56, 443–457.