Determinants of Agricultural Landowners' Willingness to Supply Open Space Through Conservation Easements

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Agricultural lands provide many amenities for landowners as well as the general public. Moreover, these lands generate many goods for consumers. Specifically, agricultural production in the Intermountain West is an important source of food for the United States (McConnell and Walls, 2005).

Agricultural land can also provide development potential. Lands used for agricultural purposes can be developed for different uses such as housing and commercial developments. The market value of a piece of ground for development purposes is usually easily quantified by examining land appraisal data.

Colyer (1998) confirms that agricultural landowners offer important amenities to the public that can be difficult to quantify in terms of importance and value. Access to public lands is one amenity provided by private agricultural lands. Such access across private lands offers recreational opportunities to the public that would not otherwise be available. Some public lands would be inaccessible if landowners did not provide this access. Wildlife habitat is another amenity provided to the public from agricultural lands. Much of the big game in the Intermountain West finds winter refuge on agricultural lands (McConnell and Walls, 2005). Wildlife habitat creates recreational opportunities, such as big game hunting (McConnell and Walls, 2005).

Open space provided by agricultural lands has been shown to be important to the general public (McConnell and Walls, 2005). Open space provides a range of benefits to many people of a community, beyond the benefits that accrue to private landowners. Parks and natural areas can be used for recreation; wetlands and forests supply storm-water drainage and wildlife habitat; farms and forests provide aesthetic benefits to surrounding residents. In rapidly growing urban and suburban areas, any preserved land can give relief from congestion and other negative

effects of development (McConnell and Walls, 2005). Both rural and non-rural communities value the amenities provided by open space, or rural landscapes (McLeod et al., 2003).

In addition to the many benefits provided by agricultural lands, they currently are under great development pressure (McLeod et al., 2003). The extent of that pressure depends on where the land is located; its production value and what is happening with the land around it. Landowners are feeling most pressure from sprawl because they are typically on lands that offer scenic views and other amenities potential developers are looking for (Kline and Wichelns, 1998).

Private land is also more accessible for development purposes in comparison to public lands. Public lands are typically unavailable for development and will remain for public use only, unless the government entity that manages it decides to do otherwise. For instance, a section of land that is maintained by the Bureau of Land Management will remain for public use unless the government decides to sell the land to a private entity (McConnell and Walls, 2005).

This increased demand for amenities and residential development creates a paradox for potential developers and the potential buyers that are looking to leave the urban areas. For these potential buyers to live in rural areas there has to be development, yet they are seeking to get away from the development that was in the urban areas. As the demand for open space increases, there needs to be a way to preserve it for both rural and non-rural inhabitants.

One tool that is currently being used to aid in the preservation of open space by landowners is conservation easements. This tool preserves amenities through the purchase of the developmental rights for a piece of property. It is a competitive and growing market where land trusts, non-profit organizations and public agencies are typically the buyers of the conservation easements, and private landowners are the sellers. Once an easement has been put in place, the

property must remain undeveloped for the length of the easement. Currently, most easements are in perpetuity, meaning they are in effect for as long as the property exists (Wiebe et al 1996).

Much of the current research regarding non-landowner preferences for land preservation indicates that recreational opportunities, wildlife habitats and open space are typically the most important things non-landowners like to see preserved (Fausold and Lilieholm, 1999). While this is an important area of research, it is also important to consider what agricultural landowners would like to preserve as they are the most likely potential suppliers of these amenities.

The specific research objective of this paper is to determine important factors affecting an agricultural producers' potential choice regarding the placement of a parcel of land under a conservation easement. Knowing these factors could be useful to communities, public organizations and land trusts trying to provide open space to meet a growing demand for this public good.

The qualitative research that was done at the beginning of this research project yielded valuable information regarding the most important factors that agricultural producers consider when contemplating a conservation easement. These factors included contract length, public access, preserving wildlife habitat, maintaining managerial control and payment (Miller, 2007). However, these results do not lead to a definitive indicator of conservation easement choice, or the weighting of factors affecting that choice. Therefore, an empirical analysis is needed.

Literature Review

One approach to addressing the research objective would be to estimate a hedonic price model of conservation easements. However, very little data regarding actual conservation easement transactions is available. Thus, the most appropriate methods for evaluating landowner

preferences for conservation easements are stated choice techniques such as, contingent valuation and random utility models.

Contingent valuation is a survey method used to ascertain willingness to pay for services or environmental amenities (Kline and Wichelns, 1996). However, the use of discrete choice and stated choice questions are also conducive to the estimation of random utility models when trying to evaluate important attributes of a good impacting choice (Lancaster et al, 2007). In the case of this research, the objective is to determine factors impacting potential choice to enter into a conservation easement. As such, a random utility model is estimated from stated choice questions to achieve the research objective.

Stated Choice Methods and Random Utility Models

Random utility models assume that the decision-maker has a perfect discrimination capability (Lancaster et al., 2007). The analyst, however, typically has is incomplete information about what impacts the decision maker's choice and, therefore, this must be taken into account. Lancaster et al (2007) identifies four different sources of uncertainty: unobserved alternative attributes, unobserved individual attributes called "unobserved taste variations (pg. 7)" by Lancaster et al (2007), measurement errors and proxy, or instrumental variables.

Econometric analyses of discrete choice data have made considerable use of random utility models (RUMs) to interpret observed choice behavior (Lancaster et al, 2007). Lancaster et al (2007) presents the random utility model in the following way. Let J be a population of decision makers, each of whom chooses an action from a finite choice set C. The standard RUM assumes that person j associates utilities with the feasible actions and chooses one that maximizes utility. The inferential problem is to learn the distribution of preferences from

observation of the choices and covariates of a random sample of decision makers (Lancaster et al, 2007).

The utility is modeled as a random variable in order to reflect this uncertainty. More specifically, the utility that individual *i* is associating with alternative *a* is given by

(1) $U_a^i = V_a^i + \varepsilon_a^i$

where V_a^i is the deterministic part of the utility, and ε_a^i is the stochastic part, capturing the uncertainty. The alternative with the highest utility is supposed to be chosen. Therefore, the probability that alternative *a* is chosen by decision-maker *i* within the choice set is

(2) $P_C^i(a) = P\left[U_a^i = \max_{b \in C} U_b^i\right]$

where $P_C^i(a)$ is the probability of individual *i* choosing choice alternative *a* which is a function of U_a^i , the utility that individual *i* is associating with alternative *a* and U_b^i , the utility that individual *i* is associating with alternative *b.* Random can be used to assess stated choice questions and understand why a landowner chooses one alternative over another alternative.

The stated choice question gives scenarios, perhaps A and B, and asks the respondent to choose one of those scenarios or "Neither." The choice of A, B or Neither becomes the dependent variables in the empirical model. The data provide independent variables from various sections of the survey which are used to explain the stated choice answers. From the implicit model (1), the analyst develops equations to represent the V portion given the observable choices the respondents make. The stated choice questions and other independent

variables provide the basis for V. From this information, an empirical model can be derived, which is represented as follows:

(3) $$V = X\beta + \varepsilon$$

where V is the function comprised of dependent variables from the stated choice questions (A, B, Neither), X is the vector of independent variables including conservation easement attributes, personal or socio-demographic variables such as conservation ethic and goals for the land, β is the vector of parameters and ε is the error term (Lancaster et al, 2007).

Survey Issues

Dillman suggests a multi-stage testing process that integrates testing techniques and can be applied to either paper or electronic surveys. The process begins after the survey is considered "ready" by its developers (Dillman, 2000).

Stage 1 consists of a review by knowledgeable colleagues and analysts to ensure question completeness, efficiency, relevancy, and format appropriateness. In Stage 2 cognitive pre-testing consists of observation and "think aloud" protocols while a respondent completes the survey and is followed with a retrospective interview. This evaluates cognitive and motivational qualities of the survey. This helps to ensure wording understandability, interpretation consistency, logical sequencing, and overall positive impression from the look and feel of the survey. Stage 3 consists of a small pilot study that emulates all the procedures proposed by the main study (Dillman, 2000).

Dillman suggests, that when pre-testing the instrument for large surveys, a sample of 100-200 individuals should complete the survey. The resulting data should then be analyzed to determine opportunities and needs for question scaling improvement, reducing the number of questions due to high correlation, eliminating or changing questions with high non-response

rates, testing if open ended questions provide useful information, and to estimate response rates. In the last stage, Stage 4, researchers conduct one last check using people who have no connection to the survey. The objective is to catch typos and errors that may have been inadvertently introduced during the last revision process (Dillman, 2000).

Methods

Information was gathered for this research in two phases. There was a qualitative phase and a quantitative survey phase. A survey is used to collect data on landowners' preferences regarding the supply of open space through conservation easements. Information to construct a survey was obtained through a series of focus groups held in Wyoming and Colorado. Data were collected through open-ended group interviews and participant observation. Focus groups were held in a very informal environment, and landowners were encouraged to speak whatever their thoughts were about the issue. Results from these focus groups were used to develop the survey instrument.

As per Dillman (2000), experts in survey methods and design were mailed the survey for feedback. The survey was then pre-tested with landowners attending the University of Wyoming Homecoming, the Albany County Stockgrower's meeting and the Carbon County Stockgrower's meeting. Changes were made to the survey and several faculty members from Colorado State University, that were not a part of the project, as well as research team members read the survey again and changes were made.

Wyoming Agricultural Statistics Service in conjunction with the Colorado Agricultural Statistics Service office drew a random sample of agricultural producers in Wyoming and Colorado that had at least fifty acres and one thousand dollars annually in sales. The random

sample was stratified by acres owned and dollars of sales based on census proportions. The sample drawn was representative of producers in Wyoming and Colorado as a region. The total sample size was 4,935 potential respondents.

The survey was delivered by the National Agriculutural Statistics Service through their center in Colorado using a modified Dillman design. The first mailing was a pre-questionnaire message printed on a post card that informed potential respondents about the survey that was to come. The second mailing consisted of a cover letter, the actual survey and a business reply envelope. One week later a post card reminder was sent asking respondents to reply. Two weeks after that, the final mailing was sent out. This mailing consisted of a cover letter asking respondents to reply if they had not already done so, the survey and a business reply envelope. Two weeks after the final mailing, approximately 10 percent of the non-respondents were sampled via the telephone. Telephone respondents were asked the entire survey, not a sub-sample of questions. The overall response rate to the survey, including phone respondents, was 46 percent.

The survey consisted of four main parts. The first part of the survey included questions about the landowner's specific community. These Likert scale questions were to designed to elicit a measurement of the respondents' "sense of place" regarding his or her community. Sense of place refers to the level of connection that individuals have with their physical community (Marshall et al, 2007). The second part of the survey questioned participants about their land and their land's attributes. These questions focused on what the landowner felt his land was worth, what types of production and non-production activities took place on his property, the types of developmental pressures being felt by the landowner, and the kinds of amenities he would like to conserve on his property.

The third section of the survey focused on conservation easements. This section included questions about the landowner's personal knowledge of easements and two stated choice questions. These questions were designed to understand landowners' preferences regarding conservation easements. In these questions, respondents were asked to choose between several different alternatives and then choose the option they most preferred given the available alternatives. Respondents were asked to make the choice that best reflected their thoughts, opinions and or experiences. These stated choice questions focused on five attributes: contract length, managerial control, wildlife habitat, access and payment. The final section of the survey asked respondents about demographic characteristics. (See Appendix A for the survey).

An orthogonal design for the stated choice questions was determined using SAS (SAS, 1990). The design which had the highest diagonal efficiency (nearly 95%) with the least number of stated choice pairs was chosen. Twelve versions of the survey, containing two stated choice questions, each was developed with variable attribute levels across each easement scenario. These twelve versions were mailed to an equal number of potential respondents in the sample. It is important to note that a thirteenth version of the survey was developed and mailed to participants which was designed to elicit preferences for conservation easements, but did not use stated choice questions to do so. For purposes of this thesis, the results will focus only on responses to those versions of the survey using the stated choice questions. (See Appendix A for the twelve versions).

The focus groups and qualitative analysis done earlier in the research led to gathering information regarding the most important factors that agricultural producers' consider when electing whether or not to enter into a conservation easement. These factors are shown below in hypothesis format.

Hypotheses to be tested are as follows:

H0: Level of payment does not affect agricultural landowners' willingness to enter into a conservation easement.

HA: Level of payment does affect agricultural landowners' willingness to enter into a conservation easement.

H0: Length of easement does not affect agricultural landowners' willingness to enter into a conservation easement.

HA: Length of easement does affect agricultural landowners' willingness to enter into a conservation easement.

H0: Wildlife habitat conservation does not affect agricultural landowners' willingness to enter into a conservation easement.

HA: Wildlife habitat conservation does affect agricultural landowners' willingness to enter into a conservation easement.

H0: Loss of managerial control does not affect agricultural landowners' willingness to enter into a conservation easement.

HA: Loss of managerial control does affect agricultural landowners' willingness to enter into a conservation easement.

H0: Public access does not affect agricultural landowners' willingness to enter into a conservation easement.

HA: Public access does affect agricultural landowners' willingness to enter into a conservation easement.

The empirical model was estimated as a multinomial logit using maximum likelihood via LIMDEP software (Greene, 2002). The goal is to estimate the probability of which stated

choice option (A, B, Neither) the landowner will choose as a function of the independent variables. The probability that individual i will choose choice j :

$$\text{Prob}(i / j) = \frac{\exp V_i}{\sum_{J=1}^{j} \exp V_j}; J = (1,.....,i.....) \quad (i \neq j) \qquad (4)$$

(Lancaster et al, 2007)

The original data set was in single line format for each respondent, and had to be transformed into three lines of data per respondent for each stated choice question. Any line which contained missing data in the stated choice questions for the model variables were skipped.

Upon receiving the data, correlation tests were run to determine the most statistically significant variables in explaining the responses to the stated choice questions. These results pointed to candidate variables for the model along with any others deemed as necessary given theory and/or qualitative results from the focus groups. Descriptive statistics and correlation analyses were estimated to investigate potential data errors and candidate variables for the model. Theory, focus group results and goodness of fit were used as criteria for final model selections. Table 1 shows a list of the variables used in the final model and their expected signs.

Table 1: Variables and Expected Signs

Variable	Abbreviation	Measurement Level	Expected Sign
Contract Length	Clpt	Perpetuity=0 Term=1	+
Access	Accpt	No Access=0 Access=1	-
Wildlife Habitat Conserved	Whpt	No Conservation=0 Conservation=1	+
Managerial Control	Conpt	No=0 Yes=1	-
Payment for Rights	Paypt	0%, 25%, 50%, 100% of land value	+
State	Statecd	Colorado=8 Wyoming=56	-
Productive Capability of the land	partb2a	Likert 1-5 1=Highly Unproductive 5=Highly Productive	-
Connection to Community	Commun	Summation of 17 Likert Questions	+
Constant	Ascn	N/A	+
Years on Land	Years	Interval Level	+
Level of Education	Edu	Ordinal Level	+
Annual Agricultural Sales	Income	Dollar Amount	+
Easement is already in Place on Land	partb6	No=0 Yes=1	-

The multi-nomial logit function was estimated with three indirect utility functions. These equations were for Choice A (easea), Choice B (easeb) and Neither (neither). The equations for easea and easeb included the first eight variables in Table 2 to explain the probability of

choosing A or B in the stated choice questions. The final five variables in the table were used in the "neither" equation to explain the probability of choosing neither option A or B in the stated choice questions. The final utility equations in the model were as follows:

(5) U(easea) =length*clpt + accptpar*accpt + whptpar*whpt + conptpar*conpt + payptpar*paypt + statepar*statecd + b2apar*partb2a + commpar*commun/

(6) U(easeb) =length*clpt + accptpar*accpt + whptpar*whpt + conptpar*conpt + payptpar*paypt + statepar*statecd + b2apar*partb2a + commpar*commun/

(7) U(neither) =ascn + yearspar*years + edupar*edu + incomepar*income + b6par*partb6$

Where length, accptpar, whptpar, conptpar, payptpar, statepar, b2apar, commpar, yearspar, edupar, incomepar and b6par are parameter labels multiplied by the corresponding independent variable as described in Table 1.

Results

Descriptive statistics were run on all of the potential independent variables and the dependent variables. Table 2 is a summary of these statistics for the dependent variables.

Table 2: Frequency of Easement Scenario Choice

	Scenario A	Scenario B	Neither	Total
Question 1				
N	301	225	1345	1847
Percent	16.09	12.03	71.89	100.01*
Question 2				
N	273	271	1303	1847
Percent	14.78	14.67	70.55	100.00

*Total frequency percent may add to over 100% due to rounding error.

Table 2 indicates that few respondents chose one of the given easement choice scenarios. Nearly 70% of all respondents chose "Neither," and approximately 30% of the respondents chose one of the given scenarios. Table 3 is a summary of these statistics for the independent variables.

Table 3: Descriptive Statistics of Independent Variables

Variable	Mean	Minimum	Maximum	Standard Deviation
Contract Length (clpt)	.558	0.000	1.000	.496
Access (accpt)	.480	0.000	1.000	.499
Wildlife Habitat (whpt)	.490	0.000	1.000	.500
Willingness to give up Managerial Control (conpt)	.522	0.000	1.000	.499
Payment for Rights (paypt)	51.208	0.000	100.000	35.966
State (statecd)	19.700	8.000	56.000	20.609
Productive Capability of the land (partb2a)	3.612	1.000	5.000	1.050
Connection to Community (commun)	77.135	1.000	100.000	12.838
Years on Land (years)	50.195	0.000	93.000	18.974
Level of Education (edu)	2.878	1.000	6.000	1.691
Income (income)	4.573	1.000	9.000	2.211
Easement is already in Place on Land (partb6)	1.895	1.000	2.000	.307

The measures of range and central tendency show several things about the variables. They are all within the expected range of values depending on the wording of each question in the survey. The only two variables with larger than expected standard deviations are the state variable and the payment variable. The state variable is somewhat understandable because of how the question is coded (Colorado=8, Wyoming=56). Because of the large difference in these numbers, the standard deviation is understandably somewhat large.

When comparing responses from the mail survey with those from the phone follow-up, those with a higher level of education and those who were male were more likely to mail the survey back. Those with a lower level of education and those who were female were more likely to be contacted with the follow up phone interview. When these data, phone and mail survey, are aggregated, however, the responses are close to the census statistics. Table 4 shows that the respondents from the survey had a slightly smaller amount of people completing college than the census data. However, the gender data was virtually the same across both sources. Overall, it was deemed that non-response bias was not an issue in the survey data.

Table 4: Survey Data compared to Census Data*

Variable	Survey Data	Census Data
Education	18.98% Completed College	Colorado: 25% Completed College Wyoming: 21.9% Completed College
Gender	84.18% Primary Operator is Male	Colorado: 83.3% Primary Operator is Male Wyoming: 83.7% Primary Operator is Male
Age	55-59 years	Colorado: 54.5 years Wyoming: 54.1 years

*(USDA, 2005)

The results reported in Table 4 indicate the model is significant in explaining scenario choice. Results indicated a log-likelihood of -2460.597 for the model. The base log-likelihood model is -2943.931. The pseudo R-squared statistic is .164. The chi-squared statistic regarding model significance was calculated using the following formula: -2(LLbase-LLmodel) with K-1 degrees of freedom (K = number of model parameters), and is 966.668. The critical chi-square table for 11 degrees of freedom is 4.57. Thus, the model is statistically significant in explaining easement choice. Observations that contained missing data were skipped. The total number of usable observations for the model was 1,083.

Table 5: Results of Multinomial Logit Model

Variable	Parameter Estimate	Asymptotic t-statistic	Probability
Contract Length (clpt)	-.322	-4.451	0.000
Access (accpt)	-.837	-11.104	0.000
Wildlife Habitat (whpt)	-.662	-.917	.359
Willingness to give up Managerial Control (conpt)	-.582	-.811	.417
Payment for Rights (paypt)	.104	9.959	0.000
State (statecd)	-.958	-4.742	0.000
Productive Capability of the land (partb2a)	-.414	-1.002	.316
Connection to Community (commun)	.193	5.134	0.000
Parameter Constant (ascn)	.736	1.741	.081
Years on Land (years)	.116	5.233	0.000
Level of Education (edu)	-.143	-5.942	0.000
Sales (income)	-.809	-.432	.666
Easement is already in Place on Land (partb6)	.987	8.177	0.000
Critical Value: 4.57	Chi-Square: 966.668	Log-Likelihood: -2460.597	Pseudo R-Squared: .164

Of the five easement attribute variables asked about in the stated choice questions, three of them were significant. Conserving wildlife habitat and the loss of managerial control proved to not be statistically significant in explaining landowners' choice. The length of the contract was statistically significant, and somewhat counterintuitive to what was learned from the producers in the focus groups. Respondents preferred an easement that was in perpetuity over an easement that was term in length. Access also was statistically significant, and respondents were less likely to accept an easement if public access on their property was required. Payment amount was also important to respondents. As payment proportion in relation to the respondents' perception of the value of their land went up, so did the likelihood that they would accept the easement. This was expected given landowners are concerned with earning as much from their property as possible.

The state in which the respondent resided was statistically significant in the model. It showed that landowners in Colorado were more likely to accept an easement than landowners in Wyoming. This is somewhat expected as developmental pressures in Colorado are higher than Wyoming, and thus far more easements have been transacted in Colorado than in Wyoming. Moreover, the presence of land trusts in Colorado also is higher.

Neither productive capability of the land or annual agricultural sales were significant variables in the model. Years on the land and connection to community were significant in explaining the acceptance of an easement scenario. The more connected one was to their community, the more likely they were to accept an easement. The longer a respondent had lived on their land, the more likely they were to accept an easement as well.

The level of education a respondent had was also significant in the model. The sign on the variable was negative. Thus, the more education a respondent had, the less likely they were

to accept an easement. If an easement was already in place on a respondents' property, the likelihood of accepting an easement scenario increased. This variable also was significant in the model.

Conclusions

While some of the variables in the model yielded results that were expected from the information gathered in previous studies and from the focus groups, several of the variables gave surprising results. From the information that was gathered at the focus groups, many of the landowners had a clear consensus of opinion on several of the issues at hand. Most were against perpetuity, public access and loss of management control. Most were also proponents of conserving wildlife habitat and receiving the most payment possible for their rights.

The empirical results are consistent with only some of the focus group results. The empirical results regarding perpetuity are counterintuitive given the focus group results. Respondents were more likely to accept an easement that is in perpetuity, or lasts forever. This was an attribute of easements that many landowners had spoken out against in the focus groups because of the finality of it. One cause for this difference may be the loss of tax benefits. In the survey, if a respondent chose a term easement, it was made clear that they would receive none of the tax benefits available for an easement in perpetuity. It could be the case that the tax benefits are important enough to landowners that they are willing to concede their dislike for perpetuity to receive those benefits if they choose to enter into an easement. Another explanation could be the large amount of respondents that chose "Neither" in the stated choice questions. By choosing to not enter into an easement, the respondent may be showing their dislike for perpetuity.

In the focus groups, respondents were very vocal regarding their dislike for public access onto their property. Many listed this as a "deal-breaker," and said they would not enter into an

easement if this was required. The empirical results seem to support this. If access was required in the easement choice, respondents were less likely to choose that option.

Maintaining total control of their agricultural operation and their property was another issue that seemed important to many of the landowners in the focus group sessions. However, the empirical results indicate this is not a significant factor in selecting an easement scenario. It could be that some of the other variables were more important to the landowner when assessing acceptability of an easement.

Many of the landowners were very proud to be good stewards of the land. Going along with this, most believed that maintaining and supporting the wildlife on their property was very important. However, the empirical results do not support this. Conserving wildlife habitat under the easement was not a significant variable in the model. This could also indicate that the other variables weighed more heavily in their decision making process.

The amount of payment that a landowner could receive for extinguishing the development rights on their property was highly significant in the model. This is somewhat expected. The more money a landowner could receive for entering into an easement, the more likely they were to accept the easement scenario. Higher amounts of money typically increase level of utility, and thus, the above result was expected. Moreover, this suggests the potential supply of development rights for conservation easements is upward sloping.

Place of residence made a difference in the likelihood of accepting an easement. It was hypothesized that since many more easement transactions have occurred in the Colorado area, landowners might be more knowledgeable about conservation easements, and therefore would possibly be more likely to accept an easement. This proved to be true, as state was statistically significant and had the expected sign.

Neither productivity nor sales was significant in explaining easement choice. This is somewhat counterintuitive for several reasons. Those with highly productive land might be more likely to enter into a conservation easement because they could be ensuring that the land stays in production forever. Also, those with higher sales might be interested in conservation easements solely for the tax benefits.

The length of time someone has spent on their property was a significant variable in the model. This may relate to the community connection variable, which was also significant. Both of these variables may be capturing facets of "sense of place." Presumably, the longer one has lived in a certain community, the more attached they become to that community. Those that had lived in an area for a long time as well those that had a high connection to their community were more likely to enter into a conservation easement. This may be because the more attached one is to a certain place, the more willing one would be to preserve the area. These types of landowners might be more willing to give up potential development profit to conserve the area they care about so much.

Level of education also was a significant variable when determining whether or not the respondent would accept a conservation easement. Those with a higher level of education were less likely to enter into an easement. It should be noted that this is a measure of education overall, not education about conservation easements. This is somewhat counterintuitive as it was hypothesized that those with a higher level of education would be more knowledgeable about conservation easements or conservation minded. This result may indicate that those with more education are more concerned with "keeping their options open" in the future.

Whether or not a respondent had a conservation easement already in place on their property was another important variable in the model. It was statistically significant, and showed

that those who already had an easement in place were more likely to accept one of the easement choices. This could be a measure of easement satisfaction. Those with easements currently in place on their property must have some acceptable amount of satisfaction for that easement, and would be willing to enter into another one.

Little was known about landowners' actual preferences for conservation and methods to achieve it. This research has provided a foundation regarding important issues to landowners concerning land conservation. As such, more can be done to make conservation efforts more appealing to the landowner.

This survey is one of the first to address the landowners' preferences and opinions on conservation easements. As they are the suppliers of the good (land) for conservation easements, it is very important and useful to understand of the kinds of things that they factor into their decision making processes regarding conservation of their land. However, because there has been so little research on this previously, this is a very broad survey. It addresses a large number of issues in one survey. Further research examining issues raised in these results could improve the efficiency of the growing market for conservation easements.

References

Colyer, D. (1998). *Farmland Preservation Programs.* Paper presented at the Seventh International Symposium on Society and Resource Management, University of Missouri, Columbia, Missouri.

Dillman, D.A. (2000). *Mail and web-based survey: the tailored design method.* New York: John Wiley & Sons.

Fausold, C.J., and R. J. Lilieholm. (1999). "The Economic Value of Open Space: A Review And Synthesis." *Environmental Management.* 23: 307-320.

Greene, W.H. (2002). *Limdep* [Computer Program]. Plainview, NY: Econometric Software, Inc. (Version 8).

Kline, J., and D. Wichelns. (1998). "Measuring Heterogeneous Preferences for Preserving Farmland and Open Space." *Ecol. Econ.* 26: 211-214.

Kline, J., and D. Wichelns. (1996). "Public Preference Regarding the Goals of Farmland Preservation Programs." *Land Economics.* 72(4): 538-549.

Lancaster, E., J. Louviere, and T. Flynn. (2007). "Several Methods to Investigate Relative Attribute Impact in Stated Preference Experiments." *Social Science and Medicine.* 64(8): 1738-1753.

Marshall, N.A., Fenton, D.M., Marshall, P.A., and Sutton, S.G. (2007). "How Resource Dependency Can Influence Social Resilience within a Primary Resource Industry." *Rural Sociology.* 72(3): 359-390.

McConnell, V., and M. Walls. (2005). "The Value of Open Space: Evidence from Studies of Nonmarket Benefits." *Resources for the Future*, at http://www.rff.org/rff/News/Features/Value-of-Open-Space.cfm, accessed November 8, 2006.

McLeod, D., R. Coupal, A. Seidl, K. Inman and D. Taylor. (2003). "Opportunities and Challenges for Land Use Planning in the Intermountain West." *J. of Extension* 41(5): article 5. http://www.joe.org/joe/2003october/a5.shtml

Miller, A. D. 2007. *Factors Affecting Landowners' Preferences for Conservation Easements and Conserving Amenities*. Unpublished M.S. thesis. Department of Agricultural and Applied Economics, University of Wyoming: Laramie.

Mills, D. E. (1990). "Zoning Rights and Land Development Timing." *Land Economics.* 66(3): 283-293.

SAS Institute, Inc. (1990). *SAS/STAT* [Computer Program]. Cary, NC. (Version 6).

Weibe, K., A. Tegene and B. Kuhn. *Partial Interests in Land: Policy Tools for Resource Use and Conservation.* Agricultural Economic Report No. 744. Economic Research Service. Washington, D.C.: U.S. Department of Agriculture. November, 1996.