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Nonmarket Value of Western Valley Ranchland Using Contingent Valuation

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With the irreversible loss of agricultural land to development uses in certain areas, there is increased concern that land be preserved for posterity's sake. We estimate the nonmarket value of a ranchland protection program in the Yampa River Valley in Routt County, Colorado, including the Steamboat Springs resort. The case study builds on previous land preservation studies by adding several preference indicators. We find that local residents' willingness to pay is substantial, but insufficient, to justify protecting the existing quantity of valley ranchland in the study area.

Key words: agricultural land, contingent valuation, nonmarket value, willingness to pay

Introduction

Farm- and ranchland may be a source of benefits accruing to diverse public and private interests. These benefits may accrue on several levels, including individual, local, regional, state, and international, and can have implications on intra- and intergenerational dimensions. The benefits derived from agricultural land may include the production of food and fiber, open space landscapes, environmental amenities, and cultural heritage (Crosson; Kline and Wichelns).

Open space values accrue to owners and renters of land and to passersby. These open space benefits can be visual (aesthetic or landscape), recreational, and therapeutic (Crosson; Rolston). Environmental amenities include watershed and soil conservation and plant and animal habitat, which in turn promote biological diversity that may not be available in purely urban settings (Bryant; Pope; Rolston). Biodiversity promotes the potential economic, scientific, and medicinal benefits of certain species that as yet remain unknown (Rolston), and farm- and ranchland themselves may be important for their heritage value, both culturally and naturally (Berry 1986, 1987; Hite and Dillman; Rolston). Therefore, the welfare of individuals and communities may be greatly affected when land is irreversibly converted to other uses (subdivisions, industrial and municipal, transportation, and utility easements). McConnell reports that the average rate of converting farm- and ranchland to development uses was approximately 0.57% per year in the United States during 1950–85. Kaiser and Wright estimate about one and a half

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Table 1. Studies of Household Willingness to Pay (WTP) for Preservation of Farm and Ranch Open Space in Canada and the United States, 1994 Dollars

Study Area, Resource, and Source	Acres[a]	Average Annual Household WTP ($/1,000 acres)	Year, Sample Size, and Population (Household)
South			
Prime agricultural land in Piedmont area of Greenville County, South Carolina. Bergstrom, Dillman, and Stoll.	18,000/25	9	1982/250 and 108,193
	36,000/50	10	
	54,000/75	12	
	72,000/100	14	
Alaska			
Old Colony and homestead farms in the Matanuska-Susitna valleys near Anchorage in southcentral Alaska. Beasley, Workman, and Williams.	3,500/50	114	1983/119 and 8,900
	7,000/100	216	
North			
Farms in Deerfield, East Longmeadow, and Greenfield townships in western Massachusetts. Foster, Halstead, and Stevens; Halstead.	1,322/33	200	1981/85 and 4,870
	2,644/66	291	
	3,967/100	358	
Canada			
Agricultural land in the Kent, Albert, and Westmorland three-county area of New Brunswick province in eastern Canada. Bowker and Didychuk.	23,750/25	49	1991/92 and 34,740
	47,500/50	68	
	71,250/75	78	
	95,000/100	86	

[a] Acres to protect and the percent of total acres available.

million acres per year of agricultural land is converted to nonagricultural uses. The conversion rate for specific areas can greatly exceed these national estimates.

Gardner and Crosson conclude that the value of open space, as well as environmental, and cultural values associated with agricultural land are not properly accounted for in land prices due to market failure. This is partly due to land having mixed private–public goods characteristics. A difficulty with measuring the value of changes in nonmarket amenities may be due to the complexity of substitutions involved. For example, Crosson argues that the cultural values of freedom, independence, and the democratic process are not adversely affected by the allocation of land: the loss of one form of independence associated with land ownership may be adequately compensated for by greater independence in another form. The same may be true for freedom and the maintenance of democratic institutions. However, farm- and ranchland as a source of cultural heritage are not substitutable; they support a unique history of the area.

This study measures the external benefits of protecting valley ranchland in the mountainous west. To date, four other studies have been conducted in the southeast (Bergstrom, Dillman, and Stoll), the northeast (Foster, Halstead, and Stevens; Halstead), and Alaska (Beasley, Workman, and Williams) of the United States, and in eastern Canada (Bowker and Didychuk). Table 1 summarizes the literature on household willingness to pay for preserving agricultural open space in the counties where they live. Local government units are interested in local benefits because they are primarily responsible for land use decisions such as zoning, land tax assessment, purchase of land or development rights for open space, and providing local recreation opportunities.

These regional case studies show that local willingness to pay is a function of increments in the amount of open space protected in each county, consistent with the economic theory of diminishing marginal utility. Findings of the South Carolina and New Brunswick case studies indicate that benefits are not sufficient to justify the costs of purchasing agricultural open space. Estimated benefits from the Alaska study, discounted at 6% interest show the benefits of an open space program would justify its costs. Reanalysis of the household willingness-to-pay data for open space in Alaska and Massachusetts estimates that social welfare would be maximized with about 20% more than the existing open space near urban centers (Lopez, Shah, and Altobello).

Part of the difference in willingness to pay across past studies may be the result of research methods. There may be other important differences such as interdependence among the four values for incremental quantities reported by each respondent, discussed in Bowker and Didychuk. This can be due to "warmglow" and or embedding effects. Warmglow is when the respondent is primarily bidding for a worthy cause that generates a good feeling, resulting in similar mean bids for varying quantities of a good. Embedding effects (Kahnemann and Knetsch) arise when responses for a resource are influenced by other values or attitudes, potentially resulting in the wrong sign on key regression variables.

Method

Numerous techniques are available for money-metric estimation of nonmarket benefits including contingent valuation, travel cost, and hedonic pricing. Due to limitations identified by Young and Allen in use of travel cost and hedonic pricing approaches in measuring nonmarket benefits specific to countryside amenities, we agree with their suggestion that contingent valuation appears to be the most viable method available when passive use values are significant. Contingent valuation allows investigating preferences when program or policy change effects go beyond past experience.

The contingent valuation method (CVM) directly estimates economic worth as willingness to pay (WTP) or compensation demanded by surveying or interviewing individuals. A hypothetical market is constructed in which the quantity or quality of the resource is varied or changed, and the individual bids for these changes in the resource. The consumer problem is to maximize utility:

(1) $U[R(q, w, x_R), X]$, subject to the budget constraint,

(2) $Y = p_x X + p_R x_R,$

where q is the quantity and w is the quality of land in ranching (R), x_R represents the goods purchased that are weakly complementary to valley ranch based experiences, and X represents all other goods and services consumed. In the budget constraint, (2), Y is money income and is equal to the cost of all other goods and services consumed (as the vector of prices, p_X, times the vector of goods and services, X), and the cost of weakly complementary goods in the experience of valley ranch based resources (as the vector of prices of weakly complementary goods, p_R, times the vector of these goods, x_R).

This study estimates the Bradford bid curve or total benefit function (Bowker and Didychuk) that relates the trade-off of different levels of income for varying levels of valley ranchland quantity, holding quality and utility constant. The economic measure estimated is the equivalent variation Hicksian consumer surplus. This is the total amount of income one is willing and able to pay to avoid the less preferred land allocation while maintaining current utility level. This measure is expressed as:

$$(3) \qquad U(R(q)^U, Y^0) = U(R(q)^P, Y^0 - WTP),$$

or the amount of income paid to protect valley ranch resources, where U is the utility function; $R(q)^U$ and $R(q)^P$ are the unprotected and protected quantities of valley ranchland, respectively; Y^0 is money income as a numeraire (a Hicksian composite good); and WTP is maximum willingness to pay. Equivalent variation estimates are derived based on the perspective that residents do not have a right to the amenities supported by land in agriculture and therefore must pay to avoid losing these amenities when agricultural land is converted to development uses.

Data used for estimation were collected by having respondents state their maximum annual WTP based on the modified payment card intervals with an option to write in an alternative amount (appendix). The respondents were then asked to allocate their maximum WTP between the valley near Steamboat Springs and for all other valleys in the county. This enables us to estimate three total benefit functions: for the Steamboat Springs valley where development pressures are greatest, for all other valleys in the county, and for the total county.

When respondents include other values in addition to the value of the relevant resource in their CVM derived bids, then mean bids or resource quantity regressors can have the wrong sign or be insignificant (Kahneman and Knetsch). This is the problem of embedding. Bowker and Didychuk set an internal check on embedding by having respondents bid on only one of four randomly assigned quantities. We use the same internal check on embedding with the following difference. A quantity that is randomly assigned may not be compatible with the respondent's preferences for land protection; our approach allows the respondents to express their preferred quantity prior to the WTP question. Our approach assumes the quantity consumed is fixed (not a choice variable) and is an ex post decision that conditions ex ante WTP, similar to any other endowment such as education, income, or leisure time. Therefore, it is believed that the problem of embedding is circumvented by letting the respondent tell us the quantity of the resource involved in the bid response. The respondent bids on the quantity level that is most preferred.

In constructing the questionnaire, we asked the quantity question prior to the willingness-to-pay question. One anonymous reviewer of this article commented that there is little control over response sequence in a mail survey. Respondents have an opportunity to optimize responses to these two questions, potentially resulting in simultaneity bias. Since we did not test this possibility, we assume an order of responses that do not result in this bias. The quantity selected and willingness to pay reported are not significantly correlated ($r = 0.17$), providing weak evidence in support of our assumption.

Study Area, Sample, and Survey Design

In Routt County, Colorado, including the ski resort town of Steamboat Springs, existing conditions at the time of the study included approximately 50,000 acres of valley ranchland in the county, with about 10,000 of these acres located in the Steamboat Springs valley (U.S. Dept. of Commerce 1992a). The valley near Steamboat Springs lost approximately 20% of its valley ranchland between 1990 and 1995. This is a significant trend for western ski areas. The loss in valley ranchland for Routt County has led to intervention in the market by Routt County Board of Commissioners, the governor of the state, other county groups, and nonprofit organizations such as The Nature Conservancy through zoning and other regulations, purchase of land, purchase of development rights, and formation of agricultural districts. Therefore, Routt County is a fertile area in which research can be conducted to measure the nonmarket worth of these efforts to protect valley ranchland for its open space, environmental, and cultural heritage values.

Data for the analysis of residents' preferences for valley ranch resources in the county were obtained from two mailings of a questionnaire in the winter of 1993–94. A sample frame consisting of registered voters was believed to be representative of adults 18 years of age and over, comprising 92% of the total adult population of 10,541 in the county based on 1990 U. S. census data (U.S. Dept. of Commerce 1992b). A total of 320 registered voters were randomly selected for the mailing with no household receiving more than one questionnaire. Twenty of the questionnaires were undeliverable. Over two mailings, 173 questionnaires were returned in which two were incomplete, resulting in a 57% response rate of deliverable surveys. A one dollar bill was included in the second mailing. A comparison of the sociodemographic profiles of the sample with those of the county showed no statistical difference between the sample and the larger population, implying that the sample is representative of registered voters in the county. Selected sample statistics are presented in table 2.

The questionnaire was constructed in accordance with Dillman's total design method (Dillman). It was pretested through personal interviews with a variety of individuals at various locations in Fort Collins, Colorado, using an open-ended format to determine the bid range for the modified payment card. It was also corrected for clarity and ease of answering. Many biases have been identified that can affect the results of mail surveys (Mitchell and Carson); however, proper design and implementation of the survey can mitigate many of the potential sources of bias. One possible source of bias that was tested in the current study was nonrespondent bias. Fifteen percent of the nonrespondents were randomly contacted by phone and data were collected on several sociodemographic variables, importance of the resource, amount preferred to be protected, and hypothetical voter referendum variables. These data for the respondents and nonrespondents were nonparametrically compared for statistically significant degrees of association using a chi-squared correlation test and were found to not be statistically different at the 5% level.

The mail format was chosen due to the familiarity of local residents with the resource in question based on the expressed concern and interest in protecting valley ranchland through local news media, public meetings, and involvement of nonprofit institutions, along with budgetary constraints. The scientific nature of the survey was emphasized by placing the official Colorado State University logo on all correspondence. The cover letter and survey explicitly assured the anonymity of each individual respondent. One

Table 2. Descriptive Statistics

Variable	Mean	SD	Min.	Max.
Willingness to pay, SS ($/year)	69.23	105.30	0	600
Willingness to pay, OC ($/year)	71.90	103.93	0	600
Willingness to pay, TC ($/year)	141.13	195.77	0	1,000
Preferred acres protected, SS (1,000s acres)	7.94	2.84	0	19
Preferred acres protected, OC (1,000s acres)	32.04	10.33	0	74
Preferred acres protected, TC (1,000s acres)	39.98	12.59	0	92.5
Ranch protection more important than other issues, SS (0–1)	0.62	0.48	0	1
Ranch protection more important than other issues, OC (0–1)	0.63	0.48	0	1
Ranch protection more important than other issues, TC (0–1)	0.70	0.46	0	1
Household income ($1,000/year)	54.94	38.63	6	200
Household size (no. people/household)	2.68	1.18	1	6
Age of respondent (years)	43.88	13.13	18	83
Percent of ranch protection program to be paid through taxation (0–100%)	21.23	24.07	0	100

Note: Sample size was 171. SS represents Steamboat Springs. OC means other county. TC means total county.

possible limitation of the survey was that it did not include any information on the condition of valley ranchland in the county through color photographs or maps; however, it is believed that the local residents are very aware of the conditions surrounding them with regard to the resource.

The questionnaire included 24 questions, with a brief introduction and definition of valley ranch open space. The questionnaire began with a question concerning the respondent's perceived importance of valley ranch protection as compared with other environmental issues in the county. The next question asked how much of the existing valley ranchland the respondent preferred to protect, including the possibility of expanding the resource through restoration. This was followed by two hypothetical voter referendum questions regarding potential support for a valley ranchland protection program both with and without additional cost to themselves. Next came the maximum WTP questions, including the allocation of total WTP for the whole county to the valley near Steamboat Springs and all other valleys in the county. Sociodemographic characteristics (age, income, education, experience) were also collected. The questionnaire included other questions concerning the ranking of natural and man-made assets for their contribution to the enjoyment of living in the county, support for different protection techniques (zoning and other regulations, purchase of land, or development rights by either government or nonprofit institutions, free-market allocations), and recreational-use data.

There are numerous concerns regarding the implementation of CVM as expressed by the U. S. Water Resources Council and a panel of experts convened by the National Oceanic and Atmospheric Administration (NOAA) (Arrow et al.). These concerns have to do with potential sources of bias in CVM, including elicitation methods, hypothetical market construction, payment vehicle, and questionnaire design (Mitchell and Carson). Some of the elicitation methods employed in CVM include dichotomous choice, iterative bidding, and payment card. Although NOAA recommends using a dichotomous choice approach, we used the modified payment card approach to elicit household WTP due to limitations on sample size (Cameron and James) and intended questionnaire design (Rowe, Schulze, and Breffle). Iterative bidding was not used due to budgetary constraint and use of mail survey. The payment vehicle used was an increase in taxes or prices of goods purchased (i.e., we asked individuals about their maximum WTP for open space in terms of increased taxes or prices of goods purchased) (see appendix).[1] We did not receive an inordinate amount of zero bids (approximately 6% of the sample respondents), suggesting that protest bidding was not a problem with our sample.

Empirical Model

We follow Bowker and Didychuk's approach in developing our empirical model that builds on the previous work of Beasley, Workman, and Williams; Bergstrom, Dillman, and Stoll; and Halstead. Our variable selection is consistent with Bowker and Didychuk's approach with a few exceptions. The total benefit function specification is

$$WTP_i = \beta_0 + \beta_1 AC + \beta_2 AC^2 + \beta_3 IMP + \beta_4 INC + \beta_5 SIZE + \beta_6 AGE + \beta_7 PUR + \mu_i, \quad (4)$$

where

WTP = total annual willingness to pay to protect or avoid the loss of the preferred quantity of valley ranchland that would maintain the respondent's utility level as defined in the consumer problem (1);

AC = preferred quantity of valley ranchland to be protected in thousands of acres;

IMP = a dummy variable identifying the relative importance of valley ranch open space to other environmental issues in the specified area, with 1 being more important and 0 less than or of equal importance;

INC = annual household income in thousands of dollars;

SIZE = household size in number of persons;

AGE = age of respondent in years;

PUR = willingness to protect valley ranchland through a fee-simple purchase program in percent program cost allocation; and

μ = i.i.d. mean zero random error.

We requested the respondents to tell us their preferred quantity of acreage to be protected which differs from Bowker and Didychuk's (hereafter BD) and Bergstrom, Dillman, and Stoll's land quantity variable selection, but still allows estimating a total benefit function and marginal values. Beasley, Workman, and Williams and Halstead used a "level of development" variable instead of acreage that precluded deriving marginal values. We chose a nonmonotonic functional form, the quadratic, for *AC* in the model exhibiting diminishing marginal utility.[2]

[1] Bergstrom, Dillman, and Stoll found no significant difference between tax payment and payment into a trust fund vehicles.

[2] Other functional forms tested include semi-log and double-log forms. These forms were rejected due to less statistical efficiency than the quadratic.

We included a number of shift variables consistent with previous studies.[3] These include household income, age, number of people composing the household, a strength of preference indicator, and an indicator of support for government-funded land-protection programs. Increased income is expected to shift the total benefit curve upward because of increased ability to pay. We expected that age could shift the total benefit curve either way. Age was found to be negatively related to *WTP* in Beaseley, Workman, and Williams, and positively related to *WTP* in Bergstom, Dillman, and Stoll (age was not included in BD). BD predicted that household size would positively influence *WTP*. However, our a priori expectation was that household size could influence *WTP* in either direction. Since *WTP* values are affected by household characteristics, its size may positively influence *WTP* due to the increase in number of household members benefiting from protection of the resource (Bowker and Didychuk). However, it could be argued, based on the relevant consumer problem, that the increased costs of nonworking household members would decrease ability to pay through decreased discretionary income and thus lower *WTP* values.

We also included two shift variables not found in previous studies—a strength of preference indicator based on the respondents perceived importance of protecting valley ranchland compared to other environmental issues, and a preference indicator of their support for a protection program that would cost them additional money through increased taxes. The importance indicator variable is expected to shift the total benefit curve upwards, meaning that if the resource is important to them, then they would be willing to pay more to protect it. The purchase variable was included to account for some of the disparity found in studies concerning what people say they would pay, and what they actually do pay. Increased support for a program that purchases either development rights or land with government funds would involve the realization by the respondent that increased taxation would be required. Therefore, it is expected that increasing support for this purchase program would decrease *WTP,* thus mitigating some of the effects of "warmglow" bias associated with CVM values (Arrow et al.; Kahneman and Knetsch).

Cameron and Huppert suggest that payment card data may not be continuous in form, requiring the use of some maximum likelihood estimation procedure. We used ordinary least squares to estimate the total benefit function based on tests of normality showing the dependent variable is normally distributed and that the number of intervals and option to write in an amount between the intervals resulted in semicontinuous, but not discrete data.[4] The regression parameter estimates are presented in table 3 for the three relevant areas: the valley near Steamboat Springs (SS), all other valleys in the county (OC), and for the total county (TC). All models were tested for multicollinearity and heteroskedasticity, finding no significant problems of either in the data sets.

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[3] Distance was found to be insignificant in our models and therefore was omitted. Bergstrom, Dillman, and Stoll and Halstead also found the distance of the respondent's residence from the resource to be insignificant in their models. BD found distance to be significant in their model when there is a sufficient distance between residences and the resource. In our study area, as in Bergstrom, Dillman, and Stoll's, distance was not a significant factor due to the proximity of the resource. In Routt County, valley ranch landscapes are a part of daily experiences, with the nearest valley ranch within one and a half miles of most residences, on average.

[4] Normality tests used included the Bowman and Shenton chi-squared and sample quantiles tests in LIMDEP (Greene).

Table 3. Parameter Estimates for OLS Regressions

	Regression Coefficient		
Variable	SS	OC	TC
AC	12.41	3.37	5.56
AC^2	−0.67	−0.03	−0.05
IMP	53.30	35.53	89.90
INC	0.40	0.51	0.93
SIZE	−18.37	−20.22	−38.25
AGE	−0.66	−0.30	−0.96
PUR	−0.46	−0.42	−0.92
Constant	51.05	24.60	55.49
Adjusted R^2	0.10	0.11	0.12
F-statistic (7, 136)	3.84	4.16	4.47
Log-likelihood	−1,025	−1,022	−1,129

Note: Sample size was 171. Dependent variable is *WTP*. SS is for Steamboat Springs; OC is for other county; and TC is for total county.
[a] Degrees of freedom is 163.

Results

The model-adjusted R^2s ranged from 0.10 to 0.12, which is significantly less than BD's R^2 of 0.52, but was consistent with the other studies that ranged from 0.09 to 0.38. The most consistently significant variables (prob(t) $\leq$ 0.10) across the three models are relative importance (*IMP*) and household size (*SIZE*). The importance variable is a dummy variable representing the respondent's attitude about the resource relative to other environmental issues in the county. The attitude that ranch open space is an important issue increases stated *WTP*. The strength of someone's preference for a given resource directly affects *WTP* and is captured in this variable. Attitudes and beliefs can affect stated willingness to pay and are as important in explaining the magnitude of responses as are behavioral and descriptive variables. Also, including an attitude variable provides us with the ability to control for general preference effects on stated *WTP* values.

Consistent with BD, we include a household size (*SIZE*) variable and find it very significant across the models. However, unlike BD, our variable parameter is negative in all three models. Our explanation for this result is based on the relevance of the budget constraint in the consumer problem (2). Additional nonincome generating household members reduce the household's ability to pay by increasing household costs and thus further constrain their *WTP* through decreased ability to pay.

Our acreage variable (*AC*), both linear and squared, is not highly significant in any of the three models. As presented earlier, this variable is the respondent's reported amount of acreage preferred to be protected. Concern about the insignificance of the acreage variable may be overcome to a certain degree when one compares the beta coefficients presented in table 3.[5] Based on these coefficients, the acreage variable is

[5] A beta coefficient is a standardized regression coefficient. This coefficient is calculated as the regression coefficient on the independent variable times the ratio of the standard deviations of that variable to the dependent variable. The standardization is necessary when the variables are of different measurement units such as years and dollars. The higher the beta coefficient (in absolute value), the more sensitive the dependent variable is to changes in that variable. This would be an absolute measure of sensitivity if the independent variables were orthogonal.

Table 3. Extended

Beta Coefficient			*t*-Ratio[a]		
SS	OC	TC	SS	OC	TC
0.33	0.34	0.36	1.71	1.60	1.68
−0.29	−0.19	−0.24	−1.52	−0.90	−1.17
0.24	0.16	0.21	3.24	2.18	2.82
0.14	0.19	0.18	1.93	2.53	2.48
−0.21	−0.23	−0.23	−2.62	−2.92	−2.97
−0.08	−0.04	−0.06	−1.01	−0.48	−0.81
−0.10	−0.10	−0.11	−1.44	−1.31	−1.55

generally more important than the other variables in the models. The signs on the acreage variables show that the total benefit curve is consistent with theoretical expectations in that the curve increases at a decreasing rate over the relevant range of the data and thus exhibits diminishing marginal utility. Embedding does not appear to be present in the data set.

Household income (*INC*) is highly significant in two of the models (OC and TC), but less significant in the third (SS). Our results differ from Beasley, Workman, and Williams; Halstead; and BD, who found income to be insignificant in their models. Its inclusion in CVM studies is imperative if only for theoretical consistency. As BD state, overspecification by including income in the model presents fewer estimation problems than underspecification. Income in our models is positive, meaning willingness to pay increases with increased household income. Beasley, Workman, and Williams suggested that income may be irrelevant to CVM studies because money does not actually change hands, allowing low-income households to bid as much as high-income households. The results of our models do not support this argument when income is a significant determinant of *WTP*.

We also included a purchase by government variable (*PUR*) that accounts for, in part, the reality of increased payments for protecting the resource. This purchase variable represents support for government purchase of open space where funds spent would be collected through increased taxation, but was not significant in the models. However, consistent with expectations, *PUR* causes a downward pressure on *WTP* per increased support for this method of paying for a valley ranch protection program. Including some form of an actual payment proxy variable may enhance the ability of CVM to derive realistic WTP values and thus alleviate some of the pressure from CVM critics concerning the overestimation of preferences suggested by NOAA (Arrow et al.).

We include an age variable (*AGE*) that was found in two of the previous four studies (Beasley, Workman, and Williams; Bergstrom, Dillman, and Stoll), however, it is insignificant in our models. This variable may act as a proxy for experience and or a "takingfor-granted" attitude. The older, presumably more experienced, and more familiar with having the resource available, the less the respondent is willing to pay to protect the resource. Beasley, Workman, and Williams predicted age to be inversely related to *WTP* and empirically found this result with age significant in their linear specification, but insignificant in their semi-log specification. Bergstrom, Dillman, and Stoll expected age to be positively related to *WTP,* which they empirically found. The correct interpretation of this variable for current purposes is unknown since any measure of experience in the previous studies was insignificant. However, in both studies, this proxy variable for experience exhibited the same negative relation to *WTP* impling that age may not be a good proxy for experience.

Table 4 reports *WTP* estimates based on the three models. Evident from comparing the marginal *WTP* between the regions is that respondent concern is greatest where development pressure is highest—in the valley near Steamboat Springs (SS). The other county model accounts for valley ranchland elsewhere in the county excluding the Steamboat Springs valley (OC), and total county (TC) accounts for all valley ranchland in the county, without regard for the important structural differences between Steamboat Springs and elsewhere in the county. Average annual household *WTP* to protect 25%, 50%, 75%, or 100% of the existing valley ranchland in the valley near Steamboat Springs at the time of the study are $72, $102, $118, and $121 per incremental acreage, respectively. For other valleys in the county, average annual household *WTP* to protect 25%, 50%, 75%, or 100% of the existing valley ranchland at the time of the study are $36, $68, $94, and $116 per incremental acreage, respectively. For the total county model, average annual household *WTP* to protect 25%, 50%, 75%, or 100% of the existing valley ranchland in Routt County, Colorado, are $107, $181, $231, and $256 per incremental acreage, respectively.

The results of this study can be compared with the results from studies conducted in other regions of North America (table 1). Local resident willingness to pay for valley ranch open space in the Rocky Mountains is substantially higher than for prime agricultural land in the Piedmont area of South Carolina and in eastern Canada. Willingness to pay for valley ranch open space is similar for historic farmland in south-central Alaska, but slightly less than for urban fringe farmland in western Massachusetts.

Conclusions

Our estimates of WTP for protecting valley ranchland in the mountainous West (table 4) are similar to past estimates for agricultural land in other areas (table 1). With regional marginal WTP values at only a few dollars, our results suggest that nonmarket benefits of open space, environmental, and cultural heritage values are not sufficient to override the price of land for development uses in the market. The type of development and site-specific characteristics are additional factors important when determining whether or not to intervene in the market allocation of land. With few dollars available, intervention in the land market would best be served by selecting specific parcels of high quality land with little development pressure. However, there are other methods available, such as zoning and other regulations in which economic concerns may be overridden.

Table 4. Willingness to Pay (WTP) to Protect Valley Ranchland in Three Areas

Region	Acres[a]	Household Average Annual WTP[b] ($)	Household Marginal WTP[c] ($)
Valley near Steamboat Springs	2,500 (25)	72	14.50
	5,000 (50)	102	9.16
	7,500 (75)	118	3.81
	10,000 (100)	121	0.00
Other valleys in the county	10,000 (25)	36	4.66
	20,000 (50)	68	3.92
	30,000 (75)	94	3.18
	40,000 (100)	116	2.44
Total county	12,500 (25)	107	6.93
	25,000 (50)	181	4.97
	37,500 (75)	231	3.00
	50,000 (100)	256	1.04

[a] Acres to protect and the percent of total acres available.
[b] Average annual household WTP per incremental acreage levels in column 2 based on model estimation with all other variables held constant at their mean values and multiplied by 1.6 registered voters per household. Total number of households in Routt County, Colorado, at the time of the study was 6,200 (U.S. Dept. of Commerce 1992b).
[c] Household marginal WTP per 1,000 acres at the incremental acreage level in column 2.

In two companion studies, external benefits of protecting valley ranchland across the United States for the general public (Walsh, McKean, and Rosenberger) and external benefits accruing to summer visitors of the Steamboat Springs area (Walsh et al.) were collected with preliminary results showing significant levels of benefits accruing to these two populations. Adding these general (nonvisiting) public and tourist benefits to the resident benefits may provide more valid support for intervening in the market allocation of land. It is therefore important, when measuring external benefits for policy issues, that all relevant populations of interest are included (Beasley, Workman, and Williams).

This study approaches the problem of valuing agricultural open space in a different fashion. First, this study is the only one to directly question respondents for their perceived optimal amount of open space to protect. Second, we invert the approach of valuing incremental amounts of the land resource in past studies. Our starting point is where none of the resource is protected, estimating the marginal value for decremental levels of protection. This is a subtle but important difference from past studies because it directly places the respondent in the position of losing a resource that may be "taken for granted." The results (marginal valuation) of either approach should be very similar, but our approach better mimics the respondent's perspective of protecting an existing resource.

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Appendix: Valuation Question Sequence

The questionnaire had the following question sequence in eliciting maximum *WTP*:

1. Compared to other environmental issues in the county, such as air and water quality, etc., *how important* is ranch open space in the valley around Steamboat and in other part of Routt County? Check one box in each column.

	Around Steamboat	Elsewhere in County
The single most important issue	☐	☐
One of the most important issues	☐	☐
Just as important as other issues	☐	☐
Less important	☐	☐
Not important at all	☐	☐
Not sure	☐	☐

2. *How much* of the existing ranch open space do you believe should be protected in the valley around Steamboat (10,000 acres) and other valleys in Routt County (40,000 acres)? Assume sustained county economic growth from development of other land. Check one box in each column.

	Around Steamboat	Elsewhere in County
None	☐	☐
25% of the existing amount	☐	☐
50% of the existing amount	☐	☐
75% of the existing amount	☐	☐
100% of the existing amount	☐	☐
___% more, by restoration (write in %)	☐	☐
Undecided	☐	☐

3. If an election were held today, would you vote YES or NO in a Routt County referendum on a program that would *guarantee protection of the ranch open space you prefer*? Assume there would be *no added cost* to you, but a NO vote means the ranchland you prefer would change to urban uses (housing and other resort development).

   ☐ YES ☐ NO ☐ Undecided

4. Would you be willing to pay a proportionate share of its cost? Would you vote YES or NO on the ranch open space program you prefer *with added cost* to you of at least $1 per year in taxes or prices of the things you buy?

   ☐ YES ☐ NO ☐ Undecided

5. This question is hypothetical and intended to provide an economic measure of how much you value ranch open space. *What is the ranch open space you prefer worth?* Please estimate the *maximum* amount of money you would pay to protect it. Circle the highest **annual** amount, above which you would vote NO on ranch open space protection.

0	1	5	10	15	20	30	40	50	60	70	80	90	100
125	150	175	200	250	300	350	400	450	500	___ Other (specify)			

6. How would *you allocate* the value of ranch open space you prefer (question 5) between the valley around Steamboat and valleys in other parts of the county?

   ___ % around Steamboat ___ % elsewhere in county