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The Value of Additional Central Flyway Wetlands: The Case of Nebraska's Rainwater Basin Wetlands

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Waterfowl habitat is a biological resource which is neither bought nor sold in the traditional market sense. Nebraska, which is situated near the center of the North American Central Flyway, contains unique wetland habitat. Recognizing this, resource managers working in Nebraska promote regulatory protection of such areas. This study found that Nebraskans positively value their state's Rainwater Basin wetland region in that they are willing to pay to have it maintained and expanded. In addition, this study demonstrates how this value was estimated and illustrates how such a value can assist in policy decisions regarding habitat acquisition programs.

Key words: contingent valuation, policy analysis, wetland values

Introduction

Nebraska's Rainwater Basin (RWB) wetland region is internationally recognized as a significant wetland complex, providing annual habitat to migratory waterfowl in North America's central flyway. At the turn of the century, this region encompassed some 4,000 major wetland areas, totaling approximately 100,000 acres. The North American Waterfowl Management Plan (NAWMP) of 1986, via the RWB Joint-Venture Implementation Plan, maintains the objectives of protecting and restoring the 34,000 acres of RWB wetlands that remained in the early 1990s (LaGrange) and creating an additional 25,000 wetland acres, plus 25,000 acres of adjacent uplands (Gersib et al.). These additional wetlands would restore the total wetland area to a level similar to that which existed in the late 1960s, and would help to promote disease-free waterfowl populations. The RWB wetland region is considered to have value to all Nebraskans in terms of water quality, flood control, recreation, and direct economic benefits such as revenue from waterfowl tourism and photography, as well as intrinsic value based solely on its existence.

The general objective of this study is to examine the economic feasibility and potential magnitude of publicly funded wetland acquisition programs. More specifically, this analysis uses the contingent valuation method to estimate a value for wetland habitat in Nebraska's RWB wetland region.

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Economic studies dating back to the early 1970s have derived monetary values for wetland resources (e.g., Hammack and Brown; Hanemann, Loomis, and Kanninen; Whitehead and Blomquist). The lack of market data to directly measure the value of wetland habitat for migratory waterfowl makes the valuation of this natural resource conducive to the contingent valuation method (CVM). The CVM is a survey method whereby resource values, as revealed by respondents, are contingent upon the constructed or simulated market presented in the survey (Portney). Survey respondents are essentially asked what they would be willing to pay for hypothetical improvements to a public good or natural resource (Mitchell and Carson).

Study Design and Methodology

Guidelines set forth by the National Oceanic and Atmospheric Administration's Blue Ribbon Panel (Arrow et al.) were adhered to in this study, with the exception of the personal interview recommendation. The basic procedures of the study were to use a closed-ended referendum format to elicit willingness-to-pay responses to a double-bounded valuation question. The double-bounded question consisted of two iterations. The initial question was: "Would your household be willing to pay additional annual taxes of $\$B$ to increase the area of Rainwater Basin wetlands ...?" (where $\$B$, the initial bid value, is varied among respondents). Participants then were asked whether or not they would be willing to pay either a higher (if the initial answer was YES) or a lower (if the initial answer was NO) amount. (Refer to Appendix A for a description of the hypothetical scenario and the CVM double-bounded question posed to survey respondents.) The hypothetical scenario for this study uses a payment vehicle of a general increase in household taxes to finance an RWB wetland purchase/management program.

Survey Methodology

Salant and Dillman define a sampling frame or survey population as the list of persons or households from which a sample is drawn. The sampling frame must include all elements of the population which the researcher wishes to study, in order to be used to aggregate or infer some characteristic of the entire population. For this analysis, households in Nebraska were selected as the total population or sample frame from which a random sample was drawn. The actual survey sample list of names and mailing addresses of Nebraska heads of households was purchased from Metromail, Inc., a professional survey sampling firm located in Lincoln, Nebraska.

For a discrete-choice survey with follow-up or a doubled-bounded approach, Alberini (1995a) recommends the use of a moderate number of bid sets and suggests not placing bids in the extreme tails of the willingness-to-pay distribution. In light of this, four bid sets were established (see table 1). The mean and standard deviation of willingness to pay from the open-ended pretest survey were 31.86 and 42.63, respectively. The questionnaire was reviewed and modified based on recommendations of the external pretest as well a sample of University of Nebraska students and staff members.

The second set of bid values, where B^L corresponds to a NO answer to the initial bid and B^U corresponds to a YES answer to the initial bid, are established by dividing the

Table 1. Double-Bounded Bid Structures ($)

	Follow-up Bid	
Initial Bid	Lower (B^L)	Upper (B^U)
1.00	0.10	5.00
10.00	5.00	20.00
25.00	12.50	50.00
75.00	37.50	150.00

first bid in half if the initial response is NO, and doubling it if the initial response is YES (Alberini 1995b; Cameron and Quiggin). This procedure was used as the basis of the second bid development.

At the onset, the 2,400 questionnaires were stratified so that 600 were mailed for each of the four bid structures as described in table 1. In addition, the hypothetical government program scenario (detailed in Appendix A) varied in terms of increases from the current wetlands level of approximately 34,000 acres to either 50,000, 75,000, or 100,000 acres. These three versions of the hypothetical program are later referred to as version 1, version 2, and version 3, respectively. Therefore, the 2,400 questionnaires distributed to a random sample of Nebraska households were stratified into 12 identical sets of 200 questionnaires in terms of the bid sets and the quantity change of wetlands acreage.

During the summer of 1996, a mail survey of Nebraska households was conducted, consistent with the Dillman approach (Salant and Dillman). Per this survey procedure, there were two mailings of the questionnaires, with an intermediate reminder postcard. Responses to each mailing were approximately equal. The sample was adjusted for nondeliverable and nonusable surveys, and then further refined to include only those respondents with income and education information such that the regression results could be weighted in order to minimize sample bias from those respondents with higher levels of income and education (see the "sample representativeness" section). Given these adjustments, a response rate of 46% was obtained, yielding 952 usable questionnaires.

Econometric Model

In this analysis, willingness to pay was modeled directly as described by Cameron. The model does not restrict the analysis to a specific utility functional form. Cameron's direct regression approach uses the survey information to establish upper and lower bounds, thereby censoring the data such that the respondent's true or maximum willingness to pay is an unobserved continuous dependent variable with a specified distribution, conditional upon a vector of explanatory variables, $\mathbf{x}_i$. The double-bounded data from the respondents allow an interval, consisting of the upper and lower bounds around the individual's maximum willingness to pay, to be established which is tighter than that of a single-bounded CVM study in which no follow-up questions are asked. Table A1 in

Appendix B summarizes the bounds, given the variations in responses to initial bid offers.

Let B be the initial bid value, and let B^L and B^U be the corresponding follow-up bid values (as per table 1). The true or maximum unobservable willingness to pay can be described by the following valuation function:

$$(1) \qquad \text{Max}\, WTP_i = \mathbf{x}_i'\beta + \varepsilon_i,$$

where $\mathbf{x}_i$ is a vector of attributes for respondent i including environmental attitudinal and socioeconomic characteristics, and ε_i is a random error term. The probability of getting a YES-YES response (P^{YY}) to the initial bid B and the follow-up bid B^U is:

$$(2) \qquad P_i^{YY} \equiv \Pr\{B_i \le \text{Max}\, WTP_i \,|\, B_i^U \le \text{Max}\, WTP_i\} \Pr\{B_i^U \le \text{Max}\, WTP_i\}$$
$$\equiv \Pr\{B_i^U \le \text{Max}\, WTP_i\} = 1 - G_\varepsilon(B_i^U),$$

where $G_\varepsilon(\cdot)$ is the underlying willingness-to-pay cumulative distribution. Similarly, the probabilities of getting NO-NO, YES-NO, or NO-YES responses, respectively, to the initial and follow-up bid values are as follows:

$$(3) \qquad P_i^{NN} = G_\varepsilon(B_i^L),$$
$$P_i^{YN} = G_\varepsilon(B_i^U) - G_\varepsilon(B_i),$$
$$P_i^{NY} = G_\varepsilon(B_i) - G_\varepsilon(B_i^L).$$

This model, where willingness to pay is assumed to be positive, can be combined with various distributions for $G_\varepsilon(\cdot)$—such as the log-normal, Weibull, or log-logistic distributions, which are commonly used in contingent valuation studies (Hanemann and Kanninen). The log-likelihood function is specified as follows:

$$(4) \qquad \ln L = \sum_{i=1}^{S} \Big[I_{YY}^i \ln(P_i^{YY}) + I_{YN}^i \ln(P_i^{YN})$$
$$+ I_{NY}^i \ln(P_i^{NY}) + I_{NN}^i \ln(P_i^{NN}) \Big],$$

where S is sample size and the I_{xy} terms denote an indicator function equal to one when the two responses are xy, and zero otherwise (Hanemann and Kanninen). It was assumed that the true willingness to pay is a nonnegative random variable, and thus the relationship shown in equation (1) is semi-log as shown in equation (5):

$$(5) \qquad \ln(WTP_i) = \mathbf{x}_i'\beta + \varepsilon_i, \quad i = 1, \ldots, N.$$

Thus, in the log-normal case with no covariates, $\ln(WTP) \sim N(\mu, \sigma^2)$, the expected value of willingness to pay is $\exp(\mu + ½\sigma^2)$, where the dispersion parameter σ of the willingness-to-pay distribution is also directly computed as the "scale" parameter via the maximum-likelihood estimation procedure. The scale variable is interpreted as the transformed coefficient on the bid level in the model (Hanemann and Kanninen). Alternatively, if ln(*WTP*) has a Weibull distribution, the marginal conditional mean of the willingness-to-pay distribution is given by $e^{\mu}\Gamma(1 + \sigma)$, where μ and the scale parameter σ are computed directly via the maximum-likelihood estimation procedure.

Survey Results

For the four bid structures presented in table 1, the percentages of the total number of respondents (952) corresponding to each bid set were 24.7%, 25.3%, 24.9%, and 25.1%, respectively. Among those who responded to the questionnaire, the response percentages are given in parentheses in table A1 of Appendix B for each initial bid.

The distributions of responses to the double-bounded willingness-to-pay scenario by hypothetical program version are presented in Appendix B, table A2. This table shows that as the initial bid increased, regardless of the program version, the percentage of respondents answering YES-YES declined; correspondingly, the percentage of NO-NO responses increased, with the exception of program version 3 where the number of respondents answering NO-NO declined as the initial bid increased from $25 to $75.

Table 2 identifies the variables used in this analysis, along with their definitions and means. Approximately half of the survey respondents indicated that they had visited the RWB wetland region (*VISIT*), while only about 9% of households were actually located within this region (*LOCATRWB*). The majority of respondents (about 65%) did not consider themselves to be rural residents (*RURAL*). Of the survey participants, 52% had some university education (*EDUCATN*), and 26.4% reported annual household incomes (*LOGINC*) greater than $50,000. Only 22% of respondents indicated that a portion of their annual income was from agricultural activities (*AGINC*).

Sample Representativeness

Overall, the sample of household responses appeared to be somewhat biased toward those Nebraska households with higher income and education levels. Because the sample data varied significantly from census data in terms of education and income levels, a weighted maximum-likelihood regression was run. Weights were constructed based on the sample proportions for the different levels of education and income relative to estimates of the corresponding population proportions derived from census data. One would assume that those respondents with higher levels of education and income would bias the willingness-to-pay mean and median estimates upward. Because the census does not report bivariate frequencies by education and income, estimates of these proportions are derived based on the assumption that income and education are independent. Although this is a somewhat unrealistic assumption, the weighted regression reduced the willingness-to-pay estimates by approximately 13%, thus presumably minimizing this response bias, even though not eliminating it.

Table 2. Variable Definitions and Means

Variable Name	Mean	Variable Definition
QVERS2	0.3340	Change in the quantity of RWB wetlands dummy variable (*QVERS2* = 1 if change from current level of 34,000 acres to 75,000 acres; 0 otherwise)
QVERS3	0.3529	Change in the quantity of RWB wetlands dummy variable (*QVERS3* = 1 if change from current level of 34,000 acres to 100,000 acres; 0 otherwise)
VISIT	0.5212	Whether respondent has visited the RWB wetland region (Yes = 1; No = 0)
LOCATRWB	0.0897	Whether respondent's household is located in the RWB wetland region (Yes = 1; No = 0)
RURAL	0.3446	Whether respondent identifies him/herself as a rural resident (Yes = 1; No = 0)
HUNT	0.3477	Whether members of respondent's household are recreational hunters (Yes = 1; No = 0)
FISHER	0.5116	Whether members of respondent's household are recreational fishermen (Yes = 1; No = 0)
CAMPER	0.3498	Whether members of respondent's household are wilderness campers or hikers (Yes = 1; No = 0)
BW	0.2710	Whether members of respondent's household are bird watchers/ photographers (Yes = 1; No = 0)
ENVCONT	0.3479	Whether respondent's household contributes to environmental organizations (Yes = 1; No = 0)
LOGINC	10.3720	The log of the income of the midpoint of the following 1995 household income categories (before taxes): ▸ 1 = under $10,000 ▸ 2 = $10,000–$24,999 ▸ 3 = $25,000–$34,999 ▸ 4 = $35,000–$49,999 ▸ 5 = $50,000–$74,999 ▸ 6 = $75,000 and over (a midpoint of $100,000 was used) [Note: 26.4% of respondents reported annual household income greater than $50,000.]
GENDER	0.7478	Sex of respondent (Male = 1; Female = 0)
EDUCATN	13.9	Estimated number of years of respondent's formal education [Note: 52.2% of respondents reported they had some university education.]
AGINC (dummy variables)	(Individual means in parentheses following description)	Income from agricultural/farming activities: ▸ Intercept = less than 25% ▸ *AGINC50* = 25%–50% (0.0462) ▸ *AGINC75* = 51%–75% (0.0357) ▸ *AGINC100* = 76%–100% (0.0725) ▸ *NOAGINC* = None (0.7794) [Note: 22.1% of respondents reported they had some income from agricultural activities.]
AGE	51.9924	Respondent's age in years
HHSIZE	2.7372	Number of individuals comprising household size

Regression Results

The regression model was run specifying a Weibull distribution,[1] and the regression results are shown in table 3. The McFadden pseudo-R^2 was employed as a goodness-of-fit measure of how well the model fits the observed data. For the weighted Weibull model, the pseudo-R^2 was 0.17. We expect the signs of coefficients on location in RWB region (*LOCATRWB*), rural residents (*RURAL*), and agricultural income (*AGINC*) to be negatively related to willingness to pay. Age (*AGE*) and household size (*HHSIZE*) are also expected to have negative coefficients because the elderly and those individuals with large households tend to have limited income for supporting environmental conservation or natural resource acquisition programs. On the other hand, we would expect individuals who visit wetland regions (*VISIT*) and participate in outdoor recreational activities, such as camping (*CAMPER*), fishing (*FISHER*), hunting (*HUNT*), or birdwatching (*BW*), to be willing to pay more for wetland acquisition programs than individuals who do not partake in such activities. We would also expect that an individual who has contributed to an environmental organization in the past (*ENVCONT*) would be more willing to pay for a wetland acquisition program. As the size or scope of the wetland acquisition program increases, we would expect willingness to pay to increase, albeit at a diminishing rate.

As noted above, table 3 presents the results from a censored regression model where the random error term is assumed to have an extreme value or Weibull distribution. The signs of the explanatory variables are consistent with expectations, with the exception of the wetland acquisition size dummy variables (*QVERS*2 and *QVERS*3), the recreational fishing variable (*FISHER*), and one of the agricultural income variables (*AGINC*75). However, none of these variables with inconsistent signs were statistically significant.

The lack of significance for the *QVERS*2 and *QVERS*3 program size variables indicates that willingness to pay on the part of Nebraska households for an RWB acquisition/management program is not related to the proposed acreage increase of the program. The failure of the scope test for the different versions of the program could be used to question CVM's ability to identify respondents' true valuation of the RWB wetland hypothetical scenario. The questionnaire design also may be at fault, in that the respondents did not appear to consider the size or scope of the hypothetical government program when evaluating their willingness to pay. Perhaps they were valuing waterfowl protection rather than acreage of habitat, and thus the marginal value of wetland acres is zero. Another possible explanation regarding the failure of this study's scope test (i.e., the insignificance of the *QVERS*2 and *QVERS*3 variables) may be that Nebraskans possess near-zero or perhaps negative marginal willingness to pay associated with RWB wetlands beyond a certain level or quantity. That is, the results are consistent with the hypothesis that there is positive marginal willingness to pay for RWB acquisition programs with a lower acreage base, and zero or negative marginal willingness to pay for acquisition programs that would almost triple current RWB wetland areas.

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[1] The model was also run using log-normal and log-logistic distributions. The final estimate of the maximized log likelihood was greater for the Weibull than for the log-normal or the log-logistic distributions, indicating the Weibull model to have a preferred fit.

Table 3. Weighted Regression Results, Weibull Model

Variable Name	Coefficient Estimate	Standard Error
Intercept	0.4928	1.0491
*QVERS*2	-0.1194	0.1774
*QVERS*3	0.0045	0.1760
VISIT	1.1028***	0.1594
LOCATRWB	-0.5804**	0.2671
RURAL	-0.0700	0.1778
HUNT	0.2940*	0.1772
FISHER	-0.0673	0.1573
CAMPER	0.7337***	0.1748
BW	0.4212***	0.1730
ENVCONT	0.6250***	0.1525
LOGINC	0.1198	0.0868
GENDER	0.2424	0.1901
EDUCATN	0.0897***	0.0228
*AGINC*50	-2.0910***	0.4562
*AGINC*75	0.4424	0.4100
*AGINC*100	-2.1634***	0.3895
NOAGINC	-0.1749	0.2999
AGE	-0.0164***	0.0055
HHSIZE	-0.2095***	0.0005
SCALE	1.7692	0.0650

Note: Single, double, and triple asterisks (*) denote significance at the .10, .05, and .01 levels, respectively.

Policy Analysis

The estimates of the mean and median willingness-to-pay values for the weighted or population-adjusted Weibull model are \$21.05 and \$4.17, respectively.[2] The larger mean is expected when using the Weibull distribution, due to its asymmetric distributional properties. Hanemann and Kanninen explain that given the distributional assumptions of the model, it is possible that a few respondents willing to pay the largest proposed bid set may completely determine the mean willingness to pay. The median

[2] The formulae for the mean and median willingness-to-pay (*WTP*) measures using the Weibull model are as follows: mean $WTP = e^{\mu}\Gamma(1+\sigma)$; median $WTP = e^{\mu}(\ln 2)^{\sigma}$ (Hanemann and Kanninen).

estimate (which is obviously less susceptible to the distributional assumptions of the model) appears to be a more appropriate estimate of willingness to pay in a referendum scenario, and is considered the robust lower-bound measurement of the central tendency of willingness to pay. As concluded by Hanemann and Kanninen, although the mean ($21.05 for the Weibull model) may reflect the Kaldor-Hicks potential compensating criteria, the median ($4.17 for the Weibull model) may be a more realistic measure of the central tendency of willingness to pay in a world where decisions are based on voting and where concern exists regarding the distribution of benefits and costs of a program.[3]

Alternatively, if the goal of the researcher is to report a total willingness-to-pay estimate for all Nebraska households, the mean would be the more appropriate measure to use. Given a total of approximately 600,000 households in Nebraska, the mean willingness to pay would aggregate to some $12.7 million using the weighted Weibull model results. From a practical perspective, however, where the goal of the politician or policy maker is to get a program approved via a referendum, the median measure is more useful. The 95% confidence interval for the median willingness-to-pay estimate was calculated to be $4.17 ± $2.17 for the Weibull.[4]

The weighted maximum-likelihood regression results, assuming a Weibull distribution, were used to determine welfare impacts of various referendum votes to increase taxes in order to support a program to acquire additional Rainwater Basin wetlands. The average increase in wetland acreage for the three scenarios was 41,000 acres. A social opportunity cost of these wetlands emerges from the next-best use of these lands which, in the case of Nebraska's Rainwater Basin region, would be irrigated crop production. As such, the economic or opportunity cost for the Rainwater Basin wetlands could be estimated as the cash rental rate for irrigated cropland (Cullis and Jones). This also implies the assumption that in the short run, demand for farmland is perfectly elastic.

The U.S. Department of Agriculture's Economic Research Service annually estimates the rental rate for irrigated cropland. For 1996, this figure was estimated to be approximately $112 per acre in Nebraska. Therefore, a program to purchase 41,000 acres of Rainwater Basin wetlands would consist of a social opportunity cost of approximately $4.6 million annually. The resulting net social gain or social value of such a wetland acquisition program is thus approximately $8.1 million per year. The model was also estimated for the three different acquisition programs (i.e., *QVERS*1, *QVERS*2, and *QVERS*3). The resulting net social gain from these programs varied from $6.2 million to $13.1 million annually.

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[3] Note that the Kaldor-Hicks compensating criteria state that a costless redistribution of income exists such that the gainers from a proposed project or policy should be able to compensate losers, although actual compensation is not required by the compensating criteria (Johansson).

[4] The variance for the mean and median willingness-to-pay estimates can be calculated directly, given that these measures of the central tendency of the distribution of willingness to pay are functions of the parameters μ and σ. Hanemann and Kanninen explain that when the model is parameterized in terms of μ and σ, a direct estimate of the variance of the willingness-to-pay estimates is provided via the appropriate element of the inverse of the information matrix. Essentially, the 95% confidence intervals were determined by first calculating the variance of the median willingness to pay as $\mathbf{A'VA}$, where $\mathbf{A}$ is the matrix obtained by partially differentiating the formula for the median by each of the parameters μ and σ, and $\mathbf{V}$ is the estimated covariance matrix. The 95% confidence interval was then calculated as: median ± 1.96 ($\sqrt{\text{variance}}$).

Conclusions

This study provides insights which policy makers should consider when developing Rainwater Basin wetland acquisition and/or management programs. It is important that policy makers not only understand and quantify estimates of Nebraskans' willingness to pay for such government programs, but also consider the attributes that significantly influence their willingness to pay.

The model as specified within this study indicates that from the sample of Nebraska households, Nebraskans on average would be willing to pay about $12 million annually for a government program to purchase and/or manage wetland areas in Nebraska's Rainwater Basin region. However, the results are not consistent with the hypothesis that the greater the scope of the wetland conversion program, Nebraskans would necessarily be willing to pay more. Therefore, the most efficient program is the smallest acreage quantity change considered here (an additional 16,000 acres), which is used for the policy analysis portion of this study. The results indicate a significant positive relationship between respondents' willingness to pay for an RWB wetland acquisition/management program and whether they have visited the RWB region. This relationship may be interpreted to suggest that Nebraskans support policies or programs designed to increase awareness of and support for RWB wetlands.

Based on the findings of this analysis, the variables that negatively influenced a household's willingness to pay included whether the household was located in the RWB region and whether the household earned income from agricultural activities. Conversely, those explanatory variables describing the respondents' outdoor recreational activities and whether they had ever contributed to an environmental organization were positively related to willingness to pay. Income and years of education were also positively related to willingness to pay.

The referendum survey results of this contingent valuation study indicate that if a general, annual household tax increase in Nebraska to fund an RWB wetland acquisition/management program were less than $4.17 (median willingness to pay with the weighted Weibull model) per household, a majority of households would vote in favor of such a tax increase. The *1990 Census of Population* shows the total number of Nebraska's households to be 602,363 (U.S. Department of Commerce, Bureau of the Census). Therefore, proposed tax increases of $4 and $3 per household annually would yield approximately $2.4 million and $1.8 million, respectively, in annual funding for such programs. Either of these taxation scenarios would yield sufficient funds to purchase the minimum of 16,000 acres of additional wetlands as considered within this study.

Aggregating the mean willingness-to-pay estimate of the sample using the weighted Weibull model yields an annual estimate of the value of Nebraska's RWB wetlands to Nebraskan households of approximately $12.7 million. Hanemann, Loomis, and Kanninen estimated mean willingness to pay, in terms of annual tax increases by California households for wetland maintenance and improvement programs, to range from $152 to $251—as opposed to this study's estimate of $24.96. On the other hand, Whitehead and Blomquist estimated annual mean willingness to pay by Kentucky households via a donation to a "Wetland Preservation Fund" to range between $5 and $17.

In conclusion, this research shows support on the part of Nebraska households for a government program to acquire and maintain RWB wetland areas. The evidence of positive existence value for this region to Nebraskans could be investigated further in terms of taxation programs and the tradeoffs between spending tax revenues on RWB wetlands as opposed to other government programs (such as road construction and education). Such further research could help strengthen efforts to more accurately predict Nebraskans' true willingness to pay for government RWB wetland acquisition and management programs.

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Appendix A: Hypothetical Scenario and CVM Double-Bounded Question Posed to Survey Respondents

This study is attempting to determine the value Nebraskans place on the preservation of the Rainwater Basin wetlands region in Nebraska. The question below is based on the following scenario, *which DOES NOT represent any actual plan or intent on the part of the State government. It is a research tool to obtain data regarding the value placed on the Rainwater Basin wetlands.*

Hypothetical Scenario:

The State of Nebraska is proposing to increase annual taxes on a per household basis, and use these monies to purchase and/or manage natural wetland areas in Nebraska's Rainwater Basin region. Nebraska's Rainwater Basin region, located in the south central portion of the state, has been recognized internationally as an important waterfowl habitat for migrating birds. The increased tax revenue will be directed toward actual purchase/acquisition and management activities. The goal of the program is to increase the current amount of Rainwater Basin wetlands acreage. Similar programs are being undertaken by other North American Central Flyway states to enhance and increase migratory waterfowl habitat. As a taxpayer, you must realize that these additional taxes will reduce your annual net income available for spending on other goods and services. Also, you should be aware that other wetland regions in Nebraska, such as the Platte River Wetland region, provide annual habitat for migratory waterfowl.

CVM Double-Bounded Question:

Would your household be willing to pay additional annual taxes of $\$B$ to increase the area of Rainwater Basin wetlands from the current level of approximately 34,000 acres to ___*___ acres? (Please circle the number of your answer.)

1. YES	2. NO
↕	↕
Are you willing to pay $\$B^U$?	Are you willing to pay $\$B^L$?
1. YES 2. NO	1. YES 2. NO

[*Note: There were three program versions used in this study. The quantity change from the current wetlands level of 34,000 acres varied as follows: version 1 = increase to 50,000 acres, version 2 = increase to 75,000 acres, and version 3 = increase to 100,000 acres.]

Appendix B:
Statistical Data Related to Questionnaire Responses

Table A1. Bounds on Maximum Willingness to Pay ($)

	Lower and Upper Bounds for the Different Responses			
Initial Bid	YES-YES	YES-NO	NO-YES	NO-NO
1.00	5.00, ∞ (31.49)	1.00, 5.00 (35.32)	0.10, 1.00 (5.53)	0.00, 0.10 (27.66)
10.00	20.00, ∞ (15.35)	10.00, 20.00 (25.73)	5.00, 10.00 (12.86)	0.00, 5.00 (46.06)
25.00	50.00, ∞ (9.71)	25.00, 50.00 (20.25)	12.50, 25.00 (14.77)	0.00, 12.50 (55.27)
75.00	150.00, ∞ (3.77)	75.00, 150.00 (8.79)	37.50, 75.00 (28.45)	0.00, 37.50 (59.00)

Note: Numbers in parentheses denote the percent (%) for each response category given the initial bid.

Table A2. Distribution of Responses by Hypothetical Program Version

Hypothetical Program Version	Total No. of Responses	Initial $ Bid Value[a]	Responses (%)			
			YY	YN	NY	NN
VERSION 1	298	1.00 (76)	40.8	35.5	2.6	21.1
(50,000 acres)		10.00 (75)	13.3	26.7	13.3	46.7
		25.00 (76)	9.2	14.5	15.8	60.5
		75.00 (71)	4.2	8.5	19.7	67.6
VERSION 2	318	1.00 (75)	25.3	32.1	9.3	33.3
(75,000 acres)		10.00 (82)	18.3	29.3	11.0	41.4
		25.00 (80)	12.5	22.5	18.8	46.2
		75.00 (81)	1.2	9.9	32.1	56.8
VERSION 3	336	1.00 (84)	28.6	38.0	4.8	28.6
(100,000 acres)		10.00 (84)	14.3	21.4	14.3	50.0
		25.00 (81)	7.4	23.5	9.9	59.2
		75.00 (87)	5.7	8.0	32.3	54.0

[a] Numbers in parentheses indicate actual response counts.