**If You Provide It, Will They Read It? The Effect of Information on Choices**

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**Abstract**

This paper investigates the effect of information on respondent's choices in an internet survey for measuring the value of water quality improvements in Deckers Creek (DC) watershed in Monongalia and Peterson Counties of West Virginia, USA. A multiattribute, choice experiment and multinomial logit (MNL) models are used in estimating the marginal utilities of restoring the three attributes of DC: aquatic life, swimming safety, and scenic quality. Response times serve as proxy variables regarding whether respondents read or did not read all the information provided in the survey. Response times fell quickly, but then tapered off as they progressed through the various sections of the survey. Results show that the estimated coefficients of subsamples, read and did not read all the information, were statistically different from each other. Based on log likelihood tests of MNL models, two subsamples of the survey population (read and did not read all information) were found to be from different populations. Estimates of marginal utilities reveal that respondents value aquatic life restoration the highest, followed by scenic quality restoration. Average compensating variation estimates for full restoration of the aquatic life and scenic quality attributes are $9 and $ 6 per month per household, respectively, when the subsamples are pooled. However, the individual subsamples resulted in $5 per month for aquatic life and $3 per month for scenic quality for respondents that read the information, while respondents that did not read the information resulted in statistically higher estimates of $16 and $12, respectively. While respondents' motives for not reading the resource information provided is uncertain, results show their values for watershed restoration are substantially higher than respondents that read the information.

## Introduction

Significant resources have been expended to develop and test optimal survey designs. Optimal designs minimize bias in responses to survey questions, including the context, content, and wording of surveys/questions (Dillman 2000; Mitchell and Carson 1989). Excessive and biased information can produce invalid estimates of value, so careful questionnaire design and pre-testing are necessary for eliciting accurate information.

Non-market valuation literature emphasizes the validity and reliability of welfare value estimates. The validity of estimated contingent values and reliability of conclusions based on these values rely on the information conveyed to the participants (Boyle 1989). Variation of the degree of information affects the validity of value estimates (Bateman et al. 2002; Samples, Dixon and Gowen 1986). Information tends to increase stated values and the increase is generally more significant for non-use value of goods (Bateman et al. 2002). Hence, accurate and unbiased information translate into reliable and valid value estimates. Accurate economic measures of resource values are very important inputs for natural resource management.

Respondents are assumed to make 'informed' choices to value elicitation questions in surveys. Therefore, the amount and type of information provided to respondents (including commodity definition and market description) is an important design feature (Bergstrom and Stoll 1990). Information is shown to affect respondents' choices that may lead to information bias (Cummings, Brookshire and Schulze 1986), although the magnitude and direction of bias varies with the experimental design, hypothesis tests, information content, type of information (Boyle 2003), and prior expectations (Bateman et al. 2002). However, even under optimal designs, do respondents read the information provided or are their responses based on prior information?  And, how does their use of information affect their choices and response times in a choice experiment?

There has been little formal examination of the effect of information on choices in the context of non-market valuation. Hence, this paper investigates the effect of information on respondent's choices in an internet-based survey for measuring the value of water quality improvements in Deckers Creek Watershed in Monongalia and Peterson Counties of West Virginia, USA. Our purpose here is to provide researchers involved in non-market valuation an understanding of respondents' level of information, whether provided in the context of survey or what they bring with them to the choice experiments.

**Information, Survey and Response Time in Choice Experiments**

Knowledge is accumulated facts while information consists of facts used to describe a particular situation or condition. An individual's existing knowledge affects recall and interest (Alexander, Schulze and Kulikowich 1994). Reading comprehension tests by Johnston (1984) reveal that prior knowledge influences the comprehension of texts and can be responsible for biasing the information gained from the materials provided. On the other hand, prior information is given little weight when individuals use heuristics devices. Heuristics implies reliance on current information regardless of its quality. Individuals use heuristics in forming judgments and may partition or isolate decision contexts under conditions of uncertainty (Cummings, Brookshire and Schulze 1986). When uncertainties are present, individuals tend to oversimplify problems. Precipitance and search limitation tendencies are synonymous to inefficient processing of available information and bias representation of decisions (Gallimore 1996). In this regard, researchers should be aware of these realities when preparing and implementing surveys.

Researchers consider many things in implementing a survey, such as costs, content, rewards or incentives, trusts associated with specific populations, sponsorship, and mode (Dillman 2000). Moreover, researchers need to answer the question of how much and what type of information to provide to respondents because information can influence the outcome of valuation studies (Samples, Dixon and Gowen 1986). In developing an internet survey instrument for the Florida Sea Grant Marketing Study, Larkin et al. (2001) identified the following elements to consider: response time, sophistication, expertise, web address, agency involvement, cost, software, site administration, and host site reliability.

Among the key elements to consider in an internet survey is response time, which varies with type of choice and individual preference ordering, and increases with difficulty of the decision (Peterson and Brown 1998). Response time is expected to decline as respondents progress through the various sections of the survey. Moreover, Berrens et al. (2004) shows that respondent effort is positively and significantly related to willingness-to-pay. With regard to information presentation, Blamey et al. (2000) suggested the use of 'generic form' when estimating attribute values or marginal rates of substitution. Further, the 'labeled form' is appropriate when the objective is to predict the amount of money people would actually pay to obtain a given policy alternative or meaningful labels for the apparent alternatives (Blamey et al. 2000).

**Methods**

Focus groups were conducted with local citizens and members of the Friends of Deckers Creek (FODC) during the Fall of 2001. From these focus groups, the internet survey instrument was developed and pre-tested with FODC members, the general public and students at West Virginia University following the recommendations from Dillman (2000).

The survey design and amount of information do not vary across respondents. The survey instrument is divided into four sections: (1) respondent's general information on outdoor recreation and water quality of streams in WV, (2) an introduction on valuation section, and Decker's Creek traits and importance, (3) background information on choice experiment and four independent choice questions, and (4) follow-up questions, demographics, request for address and survey completion. The electronic survey was made available to access code holders at www.nrac.wvu.edu/survey/. A copy of this survey is available upon request.

The internet survey has the capability to record the amount of time (in seconds) for the activity of respondents per page of the survey. A page of the internet survey consisted of a question or piece of information, except for the demographics section. That is, respondents were required to 'submit' their responses before proceeding to the next piece of information or question. A text database that corresponds to that survey page on a server saves the respondent's answers to questions and the amount of time each participant spends on a page. These time data allowed us to investigate whether respondents did or did not read all the commodity definitions and market descriptions. The amount of time that respondents spent per section of the survey was used as a proxy for their action—whether they read or did not read all the information provided in that particular section (s) of the survey.

The survey included three choice options of restoration levels (low, moderate and high), each with three stream quality attributes: 1) aquatic life (*AL*), 2) swimming safety (*SS*), and 3) scenic quality (*SQ*) and a cost attribute (represented by an increase in monthly utility bill ranging from $0 to $16). Each choice question included a status quo option, which represents the current conditions, to serve as a constant base from which stream quality improvements were measured. Status quo includes all low quality levels of the three stream quality attributes and represents no additional cost in monthly utility bills. The two other options (Options A and B) were randomly assigned with two levels: moderate and high (figure 1). A complete factorial of the four attribute levels in the choice scenario results in 40 possible combinations of the attribute levels, i.e. $2^3$ x $5^1$design. We formed and randomized all the possible combinations of the attribute levels, then screened for redundancies and inconsistencies in the choices. See Appendix tables 1a and 1b for the description of attributes for restoration of Deckers Creek and a sample choice question.

We employed stratified random sampling of residential telephone numbers obtained from Survey Sampling, Inc. People were contacted within the Deckers Creek watershed via telephone and asked to participate in either mail or an internet survey. Calling was done during October to November of 2002 and then in February and March of 2003. Most calls were made during Monday through Thursday between 4 to 9 pm. Respondents that agreed to participate were either mailed a paper version of the survey or they were sent an e-mail with the web site address and appropriate access code. This paper uses the internet data only.

It is hypothesized that the decision of respondents whether to do nothing or restore Deckers Creek are different in terms of their knowledge and attitudes toward stream restorations. Further, we speculate that response time declines as respondents progress through the various sections of the survey. We assume that as respondents become familiar with or learn from the survey, their response time per question will decline. Also, we test the null hypotheses that the estimated parameters (β) and compensating variation (CV) of respondents who read all the information provided (Read+) and respondents who did not read all the information provided (Read-) are the same, i.e.:

$$H_1 : \beta_i^{\mathrm{Re}\,ad+} = \beta_i^{\mathrm{Re}\,ad-} = \beta_i .$$

$$H_2 : CV_i^{\mathrm{Re}\,ad+} = CV_i^{\mathrm{Re}\,ad-} = CV_i .$$

Further, we hypothesize that the interaction effects Read+ and respondents who have high prior information (PI+), and Read- and respondents who do not have prior information (PI-) will have similar choice decisions.

Multinomial logit (MNL) models are estimated from the multi-attribute choice experiment data to determine the relationship between the choices for stream restoration and the independent variables. The MNL uses maximum likelihood estimation to estimate the coefficients and uses standard normal cumulative distribution function as link functions. The general form of MNL model is $\Pr(j) = \frac{e^{V_j}}{\sum e^{V_k}}$, i.e. the probability of choosing option *j* outcome. Individual level data obtained from the choice modeling portion of the questionnaire is modeled using NLOGIT 3.0 component of LIMDEP 8.0. The first two MNL models estimated the subsamples: Read+ and Read-, while the remaining MNL models pooled the subsamples.

A Log-Likelihood Ratio (LLR) test is used to test whether the two subsamples, Read+ and Read-, are from the same population and therefore can be pooled. The LLR test statistic used is $2(LLR_U - LLR_R)$ with a $\chi^2$ distribution and degrees of freedom equal to the number of restrictions imposed in the null hypothesis. $LLR_U$ is the log-likelihood ratio for the unrestricted model and is computed as the sum of the individual LLR's from each sample model. $LLR_R$ is the log-likelihood ratio for the restricted model based on the pooled model; i.e., it restricts the coefficients for the two subsamples to be the same.

From the estimated coefficients of the MNL model, welfare estimates as compensating variation are obtained; i.e. when choice models are reduced to a single before and after policy option (Hanemann 1984). Compensating variation is defined as:

$W = -\frac{1}{y}\left[\ln\left(e^{V_{j0}}\right) - \ln\left(e^{Vj1}\right)\right] = -\frac{1}{y}\left[V_{j0} - V_{j1}\right]$, where y is the marginal utility of income while $V_{j0}$ and $V_{j1}$ represent the indirect observable utility associated with a moderate level versus full restoration of the stream. A single change from the H set of attributes (h) results in welfare estimates of $-\frac{\beta_h}{y}$, assuming a linear utility function estimated for $V_j$.

## Results

### *Survey*

A total of 584 individuals were contacted for phone screening interviews. About 387 initially agreed to participate while 197 said otherwise. Out of 387 individuals who agreed to complete the mail or internet survey, 184 persons agreed to complete the internet sample. Ninety four out of 184 completed the internet survey (51 % response rate) and after removing incomplete survey, a total of 87 responses were used in the analyses. Out of 87 valid responses, 80 respondents chose to restore Deckers Creek across all four choice questions, while three respondents chose to do nothing and four respondents chose either to restore or do nothing in the four independent choice questions.

Fifty five percent of the respondents were female (table 1). Sixty one percent of the respondents were young (18-45 age) while 69 percent are college educated. The annual average household income of respondents was $34,900, which was close to the 2000 US census average of $41,000. Moreover, most respondents think that the three creek traits were very important to them (table 2). Eighty one percent of the respondents think that scenic quality is very important, followed by aquatic life with 71%, and swimming safety with 61%. No respondent thinks that the three traits are not important.

Respondents' decision choices for Deckers Creek restoration differ statistically in terms of their responses to the following: (a) how widespread the pollution sources of streams and rivers in West Virginia, (b) there are environmental problems associated with Deckers Creek, (c) they should not pay for restoration of Deckers Creek, and (d) they have enough information to decide which option to choose (table 3). The effect size of respondent's attitudes towards paying for Deckers Creek restoration was 0.405 while the rest were from 0.222 to 0.233. *Phi* effect size of 0.405 suggests that the strength of this choice restoration difference was between 'typical' and 'substantial' while 0.22 was close to 'typical' (Vaske, Gliner and Morgan 2002).

***Response time***

Respondents took around 14 minutes to complete the internet survey. In particular sections of the survey, respondents spent, on average, 63 seconds (range 7-459 seconds), 22 seconds (range 4-242 seconds), and 17 seconds (range 3-64 seconds) to read and provide importance ratings to the three watershed quality traits, i.e. aquatic life, swimming safety, and scenic quality. Moreover, respondents spent, on average, 50 seconds (range 3-324 seconds), 40 seconds (range 1-791 seconds), and 15 seconds (range 2-92 seconds) to read the three pages explaining the choice questions. Finally, response times to the four independent choice questions, on average, were 45 seconds (range 5-342 seconds), 22 seconds (range 3-131 seconds), 19 seconds (range 3-109 seconds) and 16 seconds (range 3-64 seconds), respectively. Response times fell quickly, but then tapered off as they progressed through various sections of the survey (figures 2a to 2c). This finding reaffirms the earlier result by Peterson and Brown (1998), which may be a reflection of respondents learning or becoming familiar with the structure of the survey.

Table 4 shows the classification of respondents based on the total amount of time they spent in completing the internet survey. There are quick responders, average responders, above average responders, and long responders. From this classification, we reclassify the respondents into two subsamples: 1) those that 'did not read all the information provided in the survey (Read-),' which is equivalent to the quick responder; and (2) those that 'read all information provided in the survey (Read+), which is equivalent to the 'average or above average, or long responders.' This reclassification was done since most respondents chose to restore Deckers Creek, hence our comparisons were made only between Option A and Option B, i.e. respondents chose between one of two options presented where restoration of stream attributes ranged from moderate to full restoration (figure 1). Reclassification resulted into 48 Read- and 52 Read+ respondents.

***Multinomial logit models***

Table 5 shows the variables utilized to represent the choice set *H* and respondent characteristics. Age and income comprised the respondent characteristics while attitude variables included stated importance of stream attributes and respondent's perception of choice questions. To check for informational effect on valuation response, we used the proxy variable for time - read all the information, prior information, and their interaction terms.

Four choice sets were presented to respondents. There are 38 respondents both from the Read- and Read+ subsamples (76 respondents in total), for a total of 608 choice responses after excluding the missing values. Five percent of responses selected no restoration while aquatic life had the highest percentage choices will full restoration (table 6). More than half of the responses selected full restoration for the aquatic life and scenic quality attributes.

Results of the MNL models are shown in table 7. The signs of the coefficients are consistent with our expectations regarding the direction of change and the $\chi^2$ statistics were statistically significant. At the one percent level of significance, the aquatic life improvement, scenic quality improvement, utility payment increase for restoration, respondents read all the information, and the interaction term 'Readinfo*Bill' were determinants of restoration choices in Deckers Creek. At the same significance level, the results indicate that age (except for the unrestricted Model 2, Read-), income, aquatic life attribute, swimming safety attribute, scenic quality attribute, swimming safety improvement, priorinfo, priorinfo*bill, and readinfo*priorinfo were not significant factors of restoration choices in Deckers Creek. As expected, younger respondents are less likely to choose full restoration of Deckers Creek because they may have less use or access to information regarding Deckers Creek. In the same way, respondents are less likely to choose full restoration if there was an increase in their utility payment. Respondents were more likely to choose full restoration for aquatic life and scenic quality. The inclusion of prior information, its interaction with the utility payment, or the interaction variable readinfo*priorinfo appears to have no significant statistical influence on respondents' choices full restoration for Deckers Creek.

Log likelihood ratio test was used to compare the pooled model (Model 3: Read+ and Read-) with the unpooled models of Read+ (Model 1) and Read- (Model 2). The log likelihood results were -386.34 for the restricted model (Model 3), -185.18 for unrestricted Model 1, and -192.76 for unrestricted Model 2. The likelihood ratio test statistic was

LR = $-2[(-185.18 - 192.76) + (-386.34)] = 16.8$.

The critical value of the $\chi^2$ distribution is 3.84 at the 95 % significance level on 1 df. The vector of estimated coefficients is not equal across data sets, thus the first null hypothesis is rejected. In this regard, respondents who read and did not read all the information provided in the survey were different from the pooled respondents in terms of how the independent variables explained restoration choices.

***Welfare estimates***

For each significant attribute improvement, the change in marginal utilities to respondents was estimated from the MNL coefficients. We derived the marginal utility estimates by taking the marginal rates of substitution between the marginal utility for full restoration of each significant stream attribute and the marginal utility for the money attribute, as follows:

-1 x $\frac{\beta_h}{y}$, where $\beta_h$ was equal to stream restoration attribute coefficient and $y$ was the coefficient for the utility bill attribute. Table 8 shows the estimated marginal utility in US $ per household per month. The restoration of aquatic life had the largest marginal utility contribution followed by the restoration of scenic quality, though they were not statistically different from each other given overlapping confidence intervals. Model 3 estimates of average marginal utility were above the numbers (aquatic=$5.09, scenic=$3.72) reported by Collins, Rosenberger, and Fletcher (2005), likely due to their inclusion of mail survey respondents. The marginal utility estimates for scenic quality restoration of Model 1 are not statistically different from Model 2. However, the aquatic life restoration between Model 1 and Model 2 is statistically different at five percent significance level; hence, the second null hypothesis is rejected. The lower average marginal utility estimates of Model 1 might be a reflection of respondent's learning curve for reading all the information provided in the survey. On the other hand, the higher average marginal utility estimates of Model 2 might be a reflection that these respondents from subsample have predetermined preferences, and so did not read all the information in the survey.

## Conclusions

A key issue that arises when conducting a survey is whether the respondents read all the information provided and how the representation of information influences their choice decisions. Since the content, access and use of information influences the outcomes of valuation studies, it is important to know how information affects choices. This study uses the data from an internet survey using response time as proxy variables for whether respondents did or did not read all the information provided in the survey. Our results showed that for the aquatic life restoration attribute, respondents that did not read all the information have higher marginal utility estimates than those respondents that did read all the information. The lesser response time may be a manifestation of predetermined preferences. If this is so, then our results does not support the findings of Holmes et al. (1998) citing the positive correlation between involvement (as measured by response time) and intensity of preference.

Individual evaluation of attributes revealed that stream restoration for aquatic life had the largest marginal utility contribution. This implied that respondents had stronger preferences for full restoration of this attribute than scenic quality. Hence, creation of an enhanced fishery habitat for naturally producing populations rather than water quality and stream habitat that cannot sustain fish population was more valued than full restoration of scenic quality attribute. Moreover, there was significant statistical difference in the welfare estimates of aquatic life attribute for the two subsamples (Read+ and Read-). Those respondents that progressed relatively quickly through the survey had substantially higher welfare measures than respondents that took longer in completing the survey. We assume the latter group spent more time learning about the resource context than the former group. The average welfare measure of two stream attribute restorations was between $9 and $6 per month per household, respectively.

Results of this experiment are expected to add to the discussion of why and how to evaluate respondents' level of information, whether provided in the context of the survey or what they bring with them to the experiment. If a respondent's level of information leads to biased choices, then a mechanism for measuring prior information may be a necessary independent variable in specified models. Knowledge tests could be used to measure their level of prior information and/or comprehension and understanding of information provided in a survey (Cameron 2005). Knowledge tests may also provide an incentive to increase respondents' use of information provided, regardless of whether they are monitored (measured response times in electronic surveys or in-person interviews) or self-administered. The broader issue of whether we want to survey an 'informed' group or the lay public is beyond the scope of this paper, but we expect it will lead to a lively discussion of its implications.

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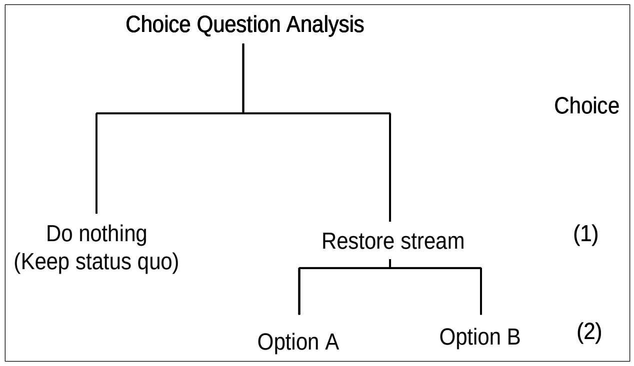


**Figure 1. Choices for Deckers Creek restoration**

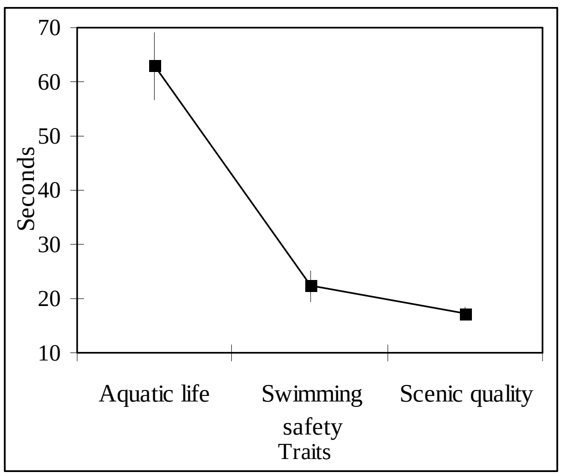


**Figure 2a. Respondent's average response time on traits questions**

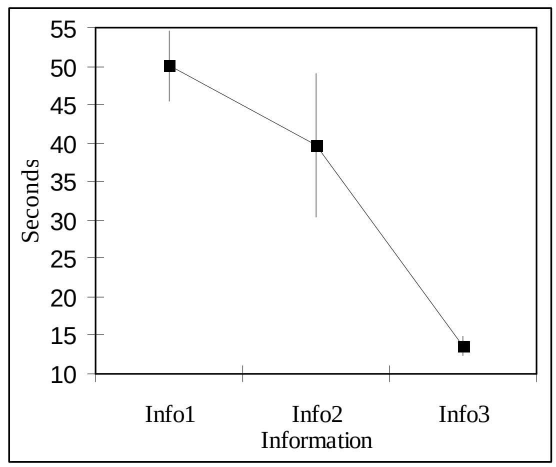


**Figure 2b. Respondent's average response time on explanation to choice questions**

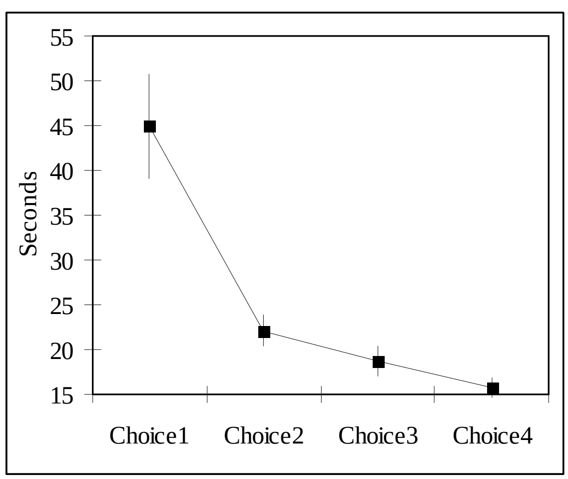


**Figure 2c. Average response time on choice questions**

**Table 1. Selected Demographic Characteristics of the Respondents**

| Characteristics | Percent (%) | Frequency |
|---|---|---|
| Gender | | |
| Female | 55 | 47 |
| Male | 45 | 38 |
| Adult population age | | |
| 18-45 | 61 | 52 |
| 46 and over | 39 | 33 |
| Education | | |
| HS diploma, GED or some college | 31 | 26 |
| College or Graduate School | 69 | 59 |
| Average annual household income | $34,900 | 76 |

**Table 2. Respondent's Importance Evaluation on Three Deckers Creek Traits**

| Traits | Very Important | | Somewhat important | | Not Important | | Total |
|---|---|---|---|---|---|---|---|
| | % | N | % | N | N | % | |
| Aquatic life | 71 | 61 | 29 | 25 | 0 | 0 | 86 |
| Swimming safety | 61 | 49 | 39 | 31 | 0 | 0 | 80 |
| Scenic quality | 83 | 71 | 17 | 15 | 0 | 0 | 86 |

**Table 3. Respondent's Restoration Choice with their Knowledge and Attitudes about Deckers Creek and West Virginia Stream Water Quality**

| Knowledge and attitudes | Choice | | *Chi-square* | *P-value* | *Phi* |
|---|---|---|---|---|---|
| | Do nothing | Restore | | | |
| *How widespread the pollution sources of streams and rivers in WV* | | | 4.034 | 0.045 | 0.222 |
| Not widespread to widespread | 3% | 97% | | | |
| Very widespread | 20% | 80% | | | |
| *I think there are environmental problems associated with DC* | | | 4.492 | 0.034 | 0.233 |
| No | 12% | 88% | | | |
| Yes | 1% | 99% | | | |
| *I don't think I have to pay for restoration of DC* | | | 13.477 | <0.001 | 0.405 |
| Strongly disagree to agree | 1% | 99% | | | |
| Strongly agree | 29% | 71% | | | |
| *I have enough information to decide which option to choose* | | | 4.034 | 0.045 | 0.222 |
| Strongly disagree to agree | 3% | 97% | | | |
| Strongly agree | 20% | 80% | | | |

**Table 4. Classification of Respondents by Survey Total Response Time in Minutes**

| Type | Percent | N |
|---|---|---|
| Quick responder: < 12 min | 48 | 42 |
| Average responder: > 12 min but ≤ 18 min | 34 | 30 |
| Above average responder: > 18 min but ≤ 24 min | 13 | 11 |
| Long responder: > 24 min | 5 | 4 |
| Total | 100 | 87 |

**Table 5. Variables Expected to be Associated with Deckers Creek Restoration**

| Variable | Description | Coding | Mean |
|---|---|---|---|
| Age | Age of respondents | *1* =18-25; *2* =26-35; *3* =36-45; 4 =46-55; 5 =56-65; 6 > 65 | 2.86 |
| Income | Household income | 1 < $10k; 2 = $10-20k; 3 = $20-30k; 4 = $30-40k; 5 = $40-50k; 6 = $50-60k; 7 = $60-70k; 8 = $70-80k; 9 =$80-90k; 10 = $90-100k; 11 > 100k | 4.51 |
| ALA | Respondent attitude that aquatic life attribute is very important | 1 = very important 0 = somewhat or not important | 0.71 |
| SSA | Respondent attitude that swimming safety attribute is very important | 1 = very important 0 = somewhat or not important | 0.56 |
| SQA | Respondent attitude that scenic quality attribute is very important | 1 = very important 0 = somewhat or not important | 0.81 |
| ALH | Aquatic life improvement | 1=full restoration 0= moderate restoration | 0.51 |
| SSH | Swimming safety improvement | 1=full restoration 0= moderate restoration | 0.50 |
| SCH | Scenic quality improvement | 1=full restoration 0= moderate restoration | 0.48 |
| Bill | Utility payment increase for restoration | $0, 1, 2, 4, 8, or 16 per month increase | 6.35 |
| Readinfo | Respondents read all the information provided in the survey | 1= Yes 0= No | 0.52 |
| Readinfo*Bill | Respondents read all the information* Utility payment | $0, 1, 2, 4, 8, or 16 per month increase | 3.16 |
| PriorInfo | Respondents have prior information to decide which option to choose | 1= agree to strongly agree 0= strongly disagree to neutral | 0.53 |
| Priorinfo*Bill | Prior information *Utility payment | $0, 1, 2, 4, 8, or 16 per month increase | 3.18 |
| Readinfo* Priorinfo | Read all information*Prior Information | 1= Yes 0= Otherwise | 0.27 |

**Table 6. Restoration Responses by Stream Attribute**

| Stream attribute | Level of restoration | | |
|---|---|---|---|
| | Low | Moderate | Full |
| Aquatic life | 5% | 39% | 56% |
| Swimming safety | 5% | 46% | 49% |
| Scenic quality | 5% | 41% | 54% |

**Table 7. Coefficient Estimates of the Multinomial Logit Models**

| Variables | Dependent variable: Choice[1] | | | | | |
|---|---|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
| Constant | -0.127 | -0.579 | -0.277 | -0.609 | -0.406 | -0.274 |
| | (0.026) | (0.419) | (0.320) | (0.341) | (0.358) | (0.322) |
| Age | 0.085 | -0.219[b] | -0.093 | -0.096 | -0.094 | -0.093 |
| | (0.111) | (0.102) | (0.068) | (0.070) | (0.068) | (0.068) |
| Income | -0.007 | 0.060 | 0.033 | 0.035 | 0.032 | 0.338 |
| | (0.060) | (0.038) | (0.031) | (0.031) | (0.031) | (0.031) |
| ALA | -0.293 | 0.473 | 0.161 | 0.109 | 0.151 | 0.163 |
| | (0.294) | (0.313) | (0.201) | (0.203) | (0.204) | (0.201) |
| SSA | 0.067 | -0.261 | -0.041 | -0.031 | -0.034 | -0.043 |
| | (0.290) | (0.314) | (0.206) | (0.209) | (0.208) | (0.207) |
| SQA | 0.272 | 0.062 | 0.127 | 0.116 | 0.151 | 0.127 |
| | (0.430) | (0.356) | (0.260) | (0.261) | (0.263) | (0.260) |
| ALH | 0.829[a] | 0.959[a] | 0.820[a] | 0.833[a] | 0.817[a] | 0.821[a] |
| | (0.255) | (0.249) | (0.173) | (0.175) | (0.174) | (0.174) |
| SSH | 0.198 | 0.121 | 0.084 | 0.121 | 0.069 | 0.085 |
| | (0.256) | (0.245) | (0.173) | (0.174) | (0.173) | (0.173) |
| SCH | 0.533[b] | 0.711[a] | 0.563[a] | 0.609[a] | 0.570[a] | 0.563[a] |
| | (0.257) | (0.245) | (0.173) | (0.173) | (0.174) | (0.173) |
| Bill | -0.154[a] | -0.058[a] | -0.096[a] | -0.054[a] | -0.080[a] | -0.096[a] |
| | (0.026) | (0.021) | (0.016) | (0.021) | (0.022) | (0.016) |
| Readinfo | | | | 0.701[a] | | |
| | | | | (0.269) | | |
| Readinfo*bill | | | | -0.093[a] | | |
| | | | | (0.033) | | |
| PriorInfo | | | | | 0.252 | |
| | | | | | (0.267) | |
| PriorInfo*bill | | | | | -0.033 | |
| | | | | | (0.032) | |
| Readinfo*Priorinfo | | | | | | -0.017 |
| | | | | | | (0.205) |
| Log likelihood function | -185.18 | -192.76 | -386.34 | -381.99 | -385.77 | -386.33 |
| LR Statistic | 51.01 | 35.25 | 69.65 | 78.33 | 70.77 | 69.66 |
| Number of observations | 304 | 304 | 608 | 608 | 608 | 608 |

[1]Item coded 0 “moderate restoration” and 1 “full restoration”
[a]Statistically significant at the 1% level.
[b]Statistically significant at the 5% level.
Numbers in parentheses are standard errors.

**Table 8. Welfare Measures of Restoration (from Moderate to Full) by Attribute**

| Restoration by attribute | Marginal utility estimates ($/household/month) | | |
|---|---|---|---|
| | Model 1 (Read+) | Model 2 (Read-) | Model 3 (Pooled) |
| Aquatic life | 5.38 (3.19-8.47)[a] | 16.53 (8.99-32.65) | 8.54 (5.78-12.41) |
| Scenic quality | 3.46 (1.53-6.17) | 12.26 (5.90-25.84) | 5.86 (3.48-9.20) |

[a]The 95% confidence interval holding marginal utility of income constant.

**Appendix Table1a. Attribute Descriptions for Restoration of Deckers Creek**

| Attribute and Level | Descriptions |
|---|---|
| *1. Ability to support aquatic life, including fish* | |
| Low | Status quo of very limited areas of fishery habitat. |
| Moderate | The water quality would be sufficient enough to support stocking of fish along the entire length of the creek (a put and take fishery). Warm water species such as bass could be placed in the lower portion and cold water species in the middle portion (trout). |
| High | The water quality and stream habitat are improved such that sustained, reproducing fish populations are established along the entire length of the creek. This would include creation of enhanced fishery habitat for naturally producing populations in the lower part of Deckers Creek from Dellslow to the Monongahela River. |
| *2. Ability to safely swim or wade in the water* | |
| Low | The status quo of unsafe for swimming due to septic and sewage overflow discharges. Staining, discoloration and acidic water also create unpleasant swimming conditions. |
| Moderate | The entire creek length meets the water quality standards for bacteria and is safe for swimming and wading. Municipal discharges (Morgantown and Masontown) of sewage are treated prior to release. No more staining, discoloration or acidic water exists. |
| High | The entire creek length exceeds the water quality standards for bacteria and is safe for swimming and wading. No untreated sewage from any source is discharged into the creek. No more staining, discoloration or acidic water exists. |
| *3. Aesthetic quality of the creek and surrounding banks* | |
| Low | The status quo level of periodic litter clean ups by volunteer groups. |
| Moderate | Regular removal of all trash from the stream and creek banks. |
| High | Regular removal of all trash from the stream and creek banks plus beautification of stream bank development along the lower part of Deckers Creek from Dellslow to the Monongahela River. This beautification would include trash receptacles along the rail-trail and vegetative planting plus erosion control along the banks where needed. |
| *4. Monetary values* | |
| $0 per month | Monetary value of status quo |
| Varies from $1 to $16 per month | Additional monthly cost per household to pay for stream restoration |

**Appendix Table 1b. Example Choice Set**

| Attribute | Status Quo Option | Option A | Option B |
|---|---|---|---|
| Aquatic life | Low | High | High |
| Swimming safety | Low | High | Moderate |
| Scenic quality | Low | Moderate | High |
| Increase in monthly utility bill | $0 | $16 | $4 |
| Choose One | □ | □ | □ |