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# Valuation of Cultural and Natural Resources in North Cascades National Park: Results from a Tournament-Style Contingent Choice Survey

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# Valuation of Cultural and Natural Resources in North Cascades National Park:
## Results from a Tournament-Style Contingent Choice Survey

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## ABSTRACT

We present the results of a new, tournament-style design of a contingent choice survey about management options at North Cascades National Park (NCNP). In our tournament-style survey, each respondent explicitly ranks several sets of scenarios and in addition several other rankings are implicit. Including the implicit rankings does not change our findings much, suggesting that the tournament-style format can add usefully to the data collected by a survey. We find strong evidence of nonuse values for both cultural and natural resource protection; indeed, nonuse values seem to dominate preferences even for those who have visited NCNP. We further find that respondents in general seem to value the protection of natural resources more than the protection of cultural resources, though both are valuable.

**Keywords:** contingent choice, tournament, cultural protection, wilderness protection, national park, nonuse values

## Introduction

In this paper we present a new design for contingent choice surveys: a tournament-style contingent ranking exercise. Each respondent ranks several groups of scenarios, with "winners" of different groups then pitted against each other until a scenario is identified as the overall top choice. Each respondent thus does several rankings, and other rankings are implicitly revealed. The tournament design should in principle increase efficiency, if as suggested in the literature respondents are more sure of their preferences for highly ranked scenarios. We also investigate whether using the implicit rankings affects our estimated results; if not, their use should enhance efficiency.

We implement our tournament-style design in an internet survey about management options at North Cascades National Park (NCNP) in Washington State. The park is remote and, in the context of U.S. national parks, relatively infrequently visited, with about 400,000 visits each year (http://www.north.cascades.national-park.com/cal.htm, accessed on January 3, 2014). Thus nonuse values, if they exist, are likely to be important; our survey design allows us to investigate this issue. The park's general management plan (National Park Service 1988) emphasizes both natural and cultural resources, so our survey also allows us to measure the relative values of natural and cultural resource protection.

The United States National Park System includes about 400 sites that collectively protect both natural and cultural resources as well as providing recreational opportunities. North Cascades National Park in Washington State was chosen for our survey since its managers focus on all of these things. The North Cascades Park General Management Plan (National Park Service 1988) identifies five attributes as the most relevant to park management and resource allocation: cultural preservation, wilderness preservation, threatened and endangered species protection, water quality, and visitation.

Many economists have studied the value of wilderness since Krutilla's (1967) seminal article, focusing mostly on recreational values but sometimes including the nonuse values that Walsh *et al* (1984) describe and Turner (2002) emphasizes as the main rationale for national parks. A few valuation studies have focused specifically on national parks and similar public lands in the US or elsewhere (e.g. Baarsma 2004, Bateman and Langford 1997, Leggett *et al*, Herath and Kennedy 2004, Liston-Heyes and Heyes 1999, Mansfield *et al* 2008, Turner *et al* 2005, and Turner and Walker 2006). Our survey design allows us to separate respondents who should have only nonuse values for North Cascades National Park resources from respondents who should have both use and nonuse values. We therefore present results for the two groups of respondents separately as well as for the two groups pooled together. This enables us to show that there are important nonuse values for this unit of the U.S. National Park System. Studies of the value of cultural preservation have a shorter history but are becoming more frequent (Navrud and Ready 2002 survey the literature as of around the turn of the century; some more recent papers are Alberini and Longo 2009, Mazzanti 2003, Rolfe and Windle 2003, Tuan and Navrud 2007, and Wang *et al* 2005).

The remainder of the paper is organized as follows. First, we describe our novel tournament-based design and compare it to other contingent choice designs. Then we present the NCNP survey and discuss the results, emphasizing three things: the importance of nonuse values, whether including implicit rankings changes the results, and the relative values of natural and cultural resource protection. The paper concludes with a summary discussion.

## A Tournament-Style Contingent Ranking Design

Choice experiments have been used in environmental and resource economics since the 1990s (see Boxall *et al* 1996, Adamowicz *et al* 1998, and Bennett and Blamey 2001, for example). Several variants exist; Hanley (2001) lists multiple references that have used choose-one, contingent rating, contingent ranking, and paired comparison methods; more recently, best-worst choices (e.g. Scarpa *et al* 2011) has emerged as another option. We use the contingent ranking method, which has been used to value a variety of environmental goods (for example Beggs *et al* 1981, Caplan *et al* 2002, Foster and Mourato 2002, Garrod and Willis 1997 and 1998, Georgiou *et al* 2004, Gonzalez and Leon 2003, Lareau and Rae 1989, Mackenzie 1993).

As the use of choice experiments has grown, so too has research into experimental design: how best to present alternative scenarios to respondents (Street and Burgess 2007 is a recent summary of the state of the art). Two particular issues are relevant for our tournament-style design: cognitive complexity (see for example DeShazo and Fermo 2002) and respondent uncertainty and therefore reliability (see for example Ben-Akiva *et al* 1991 and Foster and Mourato 2002). We argue that our design is likely to reduce cognitive complexity and increase reliability.

In our survey, respondents ranked groups of three scenarios, one being the *status quo* (no change in any attribute) and two being alternative scenarios that varied in their attribute levels. Only three scenarios were in each group since DeShazo and Fermo

(2002) suggest that including more may unduly increase cognitive burden. The contingent ranking exercise was conducted in a tournament-style format, where preferred scenarios were sequentially ranked against each other until a most-preferred scenario was revealed. The tournament format is illustrated in Figure 1. In the first round of ranking exercises, each respondent ranked four groups of scenarios. In the second round the higher-ranking alternative scenarios from the first two groups were pitted against each other and the *status quo*; similarly, another group of scenarios to rank was formed from the *status quo* and the higher-ranking alternative scenarios from the third and fourth original groups. Finally, the higher-ranking alternative scenarios from the two groups of scenarios in the second round were grouped with the *status quo* for a third round consisting of one last ranking exercise. This design facilitated a fuller set of orderings than traditional ranking exercises while minimizing task complexity since most-preferred scenarios are repeated in the rankings, and only these repeated scenarios are ranked again after the first round of rankings. Furthermore, because the format gives greater weight to these preferred scenarios, efficiency gains may be realized since the literature indicates respondents are better at ranking more-preferred options (Ben-Akiva *et al* 1991, Hausman and Ruud 1987).

In addition, after each respondent fully ranked all seven scenario groups, five implicit orderings could be calculated, as illustrated in parentheses in Figure 1, thus yielding even greater information and potentially enhancing the efficiency of the estimates. Since these implied orderings are based on later rounds of rankings, they also share the quality of giving more weight to the richer information provided by ranking the most-preferred scenarios. The derived orderings permitted the creation of five implicit

## *Figure 1*
## Illustration of Tournament-style Design and Implied Rankings

| Round 1 | Round 2 | Round 3 |
|---|---|---|
| **1** vs 2 vs SQ | **1** vs 3 vs SQ | |
| **3** vs 4 vs SQ | (1 > 4) | |
| | | **1** vs 5 vs SQ |
| | | (1 > 7, 1 > 6, 1 > 8) |
| **5** vs 6 vs SQ | **5** vs 7 vs SQ | |
| **7** vs 8 vs SQ | (5 > 8) | |

SQ: Status quo
Higher-ranked alternative scenarios in bold
Implied rankings in parentheses

scenario groups per completed bracket. The implied ordering of the *status quo* scenario within each group was determined by its relative position in the round from which a particular ordering was derived. A more complete implicit ranking is possible, but we created these groups of three to be consistent with the earlier ranking tasks. This method was based in part on Foster and Maurato's (2002) suggestion that inconsistencies are less likely to be due to fatigue or complexity than to a honing of true preferences over the course of an unfamiliar task. Further, implied groupings are based only on scenarios that were ranked at least twice, which should do more to force respondents to reconsider their true preferences than to cause undue cognitive fatigue or disability. Alternatively, it is worth noting that DeShazo and Fermo (2002) connect inconsistency with design complexity; it is assumed here that respondents were not overly burdened by the repetitive design employed.[1]

Every respondent ends up with 12 scenario groupings, 7 of which are explicit and 5 of which are implicit, each of which includes three scenarios. Thus including the

[1] In a companion paper we investigate respondent inconsistencies in our survey. While many inconsistencies were found, they did not have large effects on the estimated tradeoffs shown in Table 4.

implicit groupings almost doubles the amount of information gleaned from our survey. As described later, we test the statistical significance of differences between the results based on the explicit and implicit groupings and find some differences in coefficient estimates but almost no differences in valuation measures. We therefore conclude that adding the implicit groupings should increase the efficiency of our estimates, but that more investigation into the differences between the explicit and implicit groupings is warranted.

## North Cascades National Park Survey

Scenarios for our contingent choice survey were constructed with the five attributes emphasized by the general management plan plus a compulsory, one-time tax change, included as an implicit cost mechanism. The varying levels of the attributes, shown in Figure 2, correspond to the current situation in the park (*status quo*) and to plausible alternatives based on the management plan. Scenarios were constructed in a fractional factorial orthogonal matrix,[2] with 47 remaining once clearly sub-optimal scenarios were removed. Each scenario represents a hypothetical description of the state of the park in five years.

After respondents went through several informational web pages related to each attribute, an analysis of current park resource allocation, and a brief explanation of each attribute's levels, they were presented with several mandatory framing exercises before the contingent choice section. These served as a warm-up to the contingent choice task

[2] Much research has gone into efficient experimental design (see for example Rose and Bliemer 2009). While fractional factorial orthogonal designs are commonly used, other designs can be more efficient depending on the theoretical and econometric specifications used. An efficient design for our tournament-style design has not yet been identified.

## *Figure 2*

### North Cascades National Park Survey: Scenario Attributes and their Levels

| Attribute | Level (from lowest to highest) | | | |
|---|---|---|---|---|
| Cultural preservation | 60 (9 % fewer) structures in good condition | 66 (no change in) structures in good condition | 72 (9 % more) structures in good condition | 80 (21 % more) structures in good condition |
| Wilderness preservation | 60 acres disturbed and 963 acres unrestored (8 % less restoration) | 56 acres disturbed and 900 acres unrestored (no further restoration) | 50 acres disturbed and 801 acres unrestored (12 % more restoration) | 45 acres disturbed and 720 acres unrestored (25 % more restoration) |
| Threatened and endangered species protection | No species protected and stable | Bald eagle protected and stable (status quo) | Bald eagle and grizzly bear protected and stable | Bald eagle, grizzly bear, and two other species protected and stable |
| Water quality | 65 % unimpaired (10 % less restoration) | 75 % unimpaired (no further restoration) | 80 % unimpaired (5 % more restoration) | 90 % unimpaired (15 % more restoration) |
| Visitation | 390,000 (10 % decrease) | 430,000 (no change) | 475,000 (10 % increase) | 530,000 (23 % increase) |
| Tax | US $20 decrease | No change | US $20, $40, $55, $75, $100 increase | |

and also led respondents to consider basic tradeoffs between attributes. In line with the literature (Loomis *et al* 1994, Rolfe *et al* 1997), they were also designed to force respondents to think about competing substitute public goods and their own budget constraints. This should help reduce hypothetical bias, though some authors argue that these lead-in questions have little effect on responses (Loomis *et al* 1994, Kotchen and Reiling 1999, Whitehead and Blomquist 1999; Loomis *et al* also have an interesting exchange with Whitehead and Blomquist in the November 1995 issue of *Land Economics*).

The survey was designed[3] and pre-tested in stages from 2004 to the fall of 2005. In the spring of 2006 emails with a link to the survey's website were sent to a random

[3] We gratefully acknowledge the assistance of Pieter Hooimeijer, who did the programming and web design and whose generosity of many hours of time made the project possible.

collection of individuals in the U.S. 240 respondents gave answers to the contingent choice questions, though not all ranked every scenario group. Table 1 shows some characteristics of the respondents: what fractions belonged to societies or groups focused on environmental or historical issues; what fractions were married, female, black, or holders of college or advanced degrees; the average number of children in the household; what fractions lived in different regions of the country (northwest, southwest, midwest, and northeast); average age; and average income. The survey respondents are somewhat different on average than the US population, judging from a comparison to 2005 data from the *Statistical Abstract of the United States* (accessed on line in August 2009): the respondents are on average a little older with more education; they are also slightly more likely to be male and less likely to be black. Median incomes are about the same.

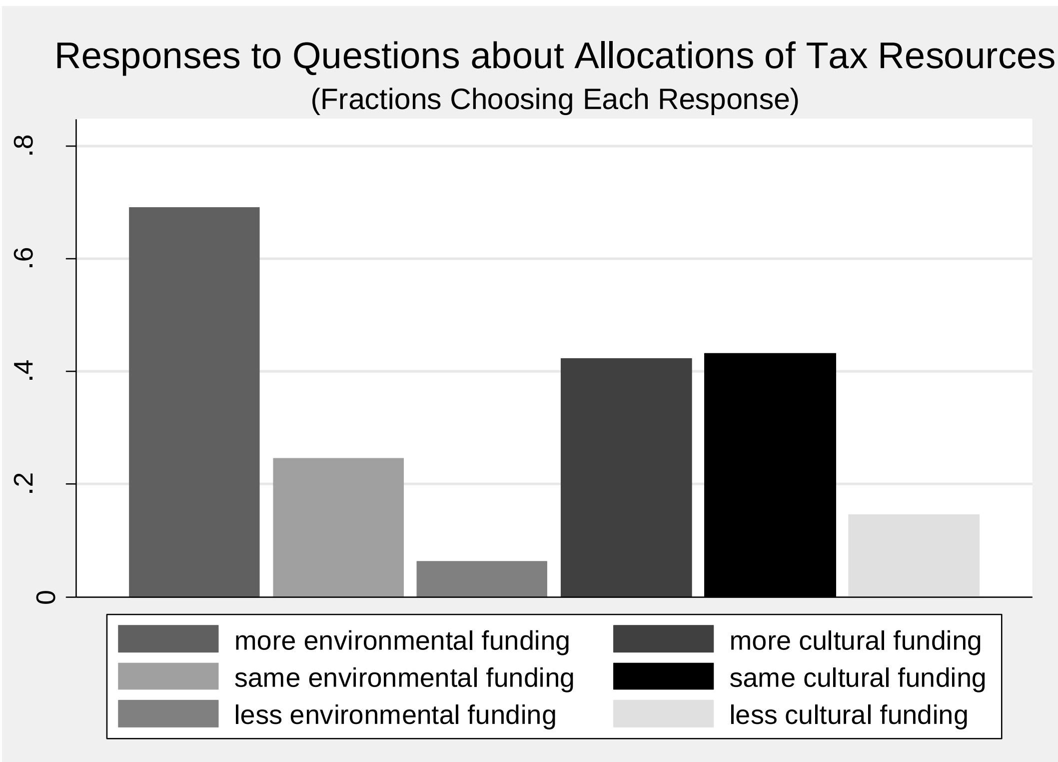
***Table 1***
**Survey Respondent Characteristics**

| Characteristic | Population[1] Mean | Survey | | | | |
|---|---|---|---|---|---|---|
| | | N[2] | Mean | Std. Dev. | Min | Max |
| Member of environmental org. | | 211 | .303 | .461 | 0 | 1 |
| Member of historical org. | | 212 | .123 | .329 | 0 | 1 |
| Married | .586 | 212 | .604 | .490 | 0 | 1 |
| Female | .507 | 217 | .452 | .499 | 0 | 1 |
| Black | .128 | 209 | .048 | .214 | 0 | 1 |
| College degree or higher | .276 | 219 | .667 | .473 | 0 | 1 |
| Number of children | .870 | 215 | .898 | 1.267 | 0 | 5 |
| Northwest | .162 | 214 | .075 | .264 | 0 | 1 |
| Southwest | .114 | 214 | .140 | .348 | 0 | 1 |
| Midwest | .222 | 214 | .257 | .438 | 0 | 1 |
| Northeast | .184 | 214 | .257 | .438 | 0 | 1 |
| Age* | 43.7 | 212 | 51.0 | 11.3 | 16 | 79 |
| Income ($thousands)* | 56.2 | 193 | 55.0 | 50.8 | 5 | 150 |

* Median; median age in the population is of the adult population only
[1]For 2005, as reported in the Statistical Abstract of the United States, accessed on line in August 2009
[2]Number of nonmissing observations

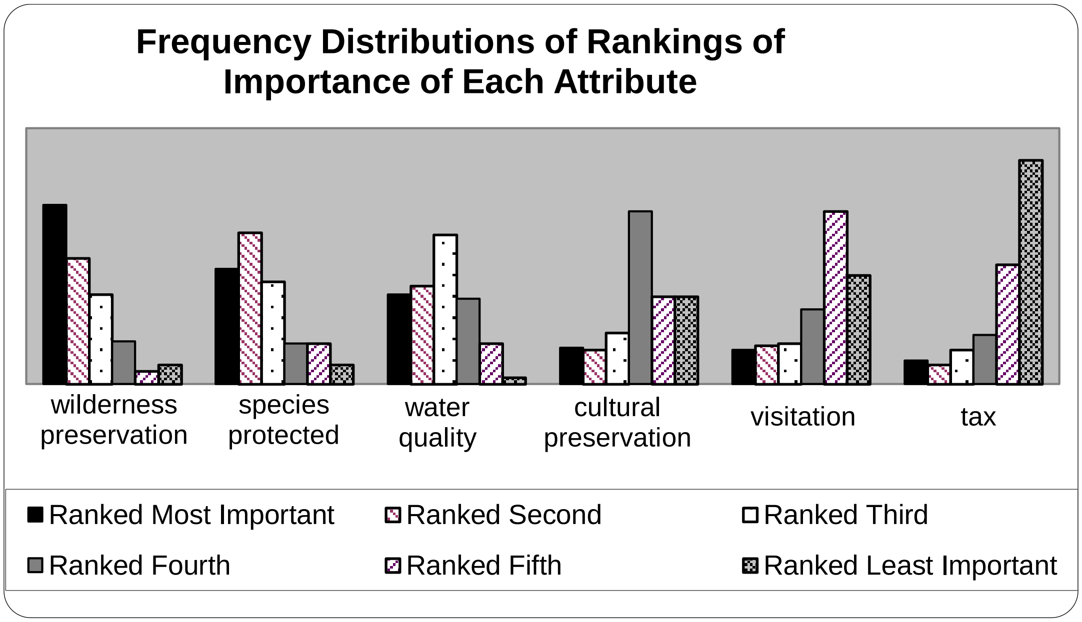
Some of the warm-up questions give possible indications of the relative importance respondents give to cultural versus natural resource protection. Respondents were asked whether more, less, or the same amount of tax resources should be spent towards environmental and cultural preservation. About two-thirds of all respondents indicated they would support a higher percentage of tax revenues devoted to environmental causes, while over half indicated that the same or less should be devoted to cultural preservation (see Figure 3). Another question asked respondents to rank each attribute relative to the others in order of importance. In general, wilderness preservation

**Figure 3**




was considered the most important attribute, followed by species protection, water quality, cultural preservation, visitation, and tax, respectively (see Figure 4).

## Figure 4




**Contingent Ranking Results**

We begin by briefly summarizing the theory underlying a rank-ordered logit model, which is the econometric specification we (as well as most other researchers who use a contingent ranking design) use. First, utility $U_{ij}$ (where $i$ indexes the individual and $j$ the scenario) is assumed to be divided into a measurable component $V_{ij}$ and a random component $e_{ij}$ which is assumed to be independent and identically distributed with a type 1 extreme value distribution. Rankings indicate relative utility levels for a respondent, for example $U_{11} > U_{12} > U_{13}$. $V$ is an indirect utility function with each park attribute ( $a_k, k = 1,\ldots,5$) plus cost ($c$; the tax attribute here) as arguments. An alternative-specific constant (ASC) representing the *status quo* scenario is often added. Personal characteristics can be added using interaction terms. For the simple, attributes-only case, the probability of a particular complete ordering of a group of scenarios for individual $i$ is

$$P\left(U_{i1} > U_{i2} > U_{i3}\right) = \frac{e^{V_{i1}}}{e^{V_{i1}} + e^{V_{i2}} + e^{V_{i3}}} \cdot \frac{e^{V_{i2}}}{e^{V_{i1}} + e^{V_{i2}}} \text{ where } V_{ij} = ASC_j + \sum_{k=1}^{5} \beta_k a_{jk} + \beta_6 c_j . \quad (1)$$

Increases in cultural preservation, wilderness preservation, species protection, and water quality are expected to increase utility and thus the likelihood of a higher ranking, all else equal, so their $\beta$ s should be positive. An increase in tax is expected to have the opposite effect, *ceteris paribus*, so $\beta_6$ should be negative. *A priori*, the sign on visitation is unknown, since more visitation probably leads to more congestion, which might be thought of as deleterious even for those with only nonuse values, but on the other hand respondents might believe there are positive spillover effects of others' visits to society at large (Turner 2002).

Equation (1) assumes that each ranking of three scenarios is independent. Each respondent generates multiple sets of rankings, so some might question this assumption. It is consistent, though, with the simple, attributes-only case we are using here which assumes that respondent characteristics do not affect utility. In any case, we follow the standard practice of assuming that (1) gives a good approximation of the true likelihood function, choosing coefficients to maximize (1), and then when estimating the variance-covariance matrix of the estimators taking into account the possible correlation of different observations from the same respondent. We use the Stata® *rologit* command with the *cluster* option, which gives a heteroskedasticity-consistent variance-covariance matrix adjusted for clusters of correlated observations.[4]

Marginal rates of substitution between pairs of attributes are, by the implicit function theorem, the negatives of ratios of coefficients in the specification of *V*. So, for

[4] Most results are unchanged if the nonrobust (and nonclustered) estimator of the variance-covariance matrix is used, except that standard errors are all smaller. The differences between coefficients in the nonusers and users subsamples in Table 2 become statistically significant, though.

example, for the basic specification shown in (1), the marginal willingness to pay for a change in attribute $a_k$ is the ratio $-\beta_k/\beta_c$ .

When estimating the rank-order logit model, we removed from the sample five respondents who reported that they were residents of a foreign country, on the grounds that U.S. national park policy should reflect primarily American preferences. We also consider two subsamples: respondents who say they have never been to North Cascades National Park and never expect to go there—our *nonusers* group—and the respondents who either have been to the park or expect to go there—our *users* group. If the nonusers have any preferences about the park's management, those preferences must reflect nonuse values.[5] The responses of the users will reflect both use and nonuse values. A few respondents did not answer the question about whether they had been or planned to go to the park, so we removed those observations as well. This left us with 207 respondents and 7419 observations (2473 sets of rankings).

Table 2 shows the results from several specifications using different subsets of the data. Columns 1 through 3 show, respectively, the rank-order logit coefficient estimates for the entire (domestic) sample and for the nonusers and users subsamples.[6] All of these samples include the implied rankings. All coefficients have the expected sign, except that visitation is statistically insignificant. Attributes have statistically significant coefficients in the nonuser column, showing that these park attributes lead to significant nonuse

[5] Bateman and Langford (1997) report results separately for survey respondents who have or have not visited the Norfolk (UK) Broads, but did not ask respondents about possible future visits. Garrod and Willis (1997) report results separately for survey respondents who seem to have an option value for a seldom-visited area of forest in the UK, but they do not ask specifically if respondents have been to that area.

[6] We explored more general specification with a complete set of interactions of the variables (other than the *status quo* dummy) and squared terms of all continuous attributes. Only two of the additional variables were statistically significant: the square of visitation and the interaction between water quality and two species protected. Adding these two variables did not change any of the results appreciably, including the tradeoffs shown in Table 4.

**_Table 2_**

Rank-Order Logit Results:

Comparing User and Nonuser subsamples

| **Attribute** | **Pooled** | **Nonusers** | **Users** |
|---|---|---|---|
| Cultural Preservation | .0106*** (.0031) | .0106** (.0048) | .0107*** (.0041) |
| Wilderness Preservation | .0147*** (.0037) | .0102** (.0050) | .0191*** (.0054) |
| Water Quality | .0379*** (.0051) | .0341*** (.0072) | .0424*** (.0073) |
| Visitation | -.0021 (.0034) | -.0078 (.0048) | .0030 (.0047) |
| Tax Change | -.0097*** (.0016) | -.0090*** (.0024) | -.0107*** (.0022) |
| No Species Protected | -.9385*** (.1311) | -.9358*** (.1957) | -.9565*** (.1802) |
| Two Species Protected | .4827*** (.1194) | .3880** (.1761) | .5893*** (.1624) |
| Four Species Protected | .8658*** (.1249) | .7418*** (.1769) | 1.0238*** (.1740) |
| ASC for *status quo* | -.3181*** (.1088) | -.2460 (.1635) | -.3893*** (.1449) |
| N | 7419 | 3531 | 3888 |
| Log likelihood | -4003.46 | -1944.37 | -2034.08 |

values. Most of the coefficients in these specifications seem quite similar across columns, and a Wald test[7] indeed fails to reject (with a p-value of 0.34) the hypothesis that the coefficients in the nonuser and user samples are the same. This suggests that nonuse values dominate even for users. The (usually) statistically significant and negative coefficient on the *status quo* dummy indicates that respondents tend to prefer alternatives; this is the opposite of what would be expected if there were a bias in favor of the *status*

[7] Wald tests (similar to Chow tests) based on the robust variance-covariance matrix adjusted for clusters are more appropriate than likelihood ratio tests if observations are not truly independent.

*quo* (Samuelson and Zeckhauser 1988):[8] in our sample, respondents apparently prefer change regardless of the attribute levels of the alternative scenarios.

We also investigated whether the use of our implied scenario rankings had an important impact on our results. Table 3 compares the coefficients for the pooled model when implicit rankings are included and when only explicit rankings are used. Based on a Wald test, the estimated coefficients are indeed different when only explicit rankings are used. But despite statistically significant differences, most coefficients are fairly similar in magnitude in the two columns.

***Table 3***

**Rank-Order Logit Results:**

**Comparing All Rankings to Explicit Rankings Only**

| **Attribute** | **All rankings** | **Explicit rankings only** |
|---|---|---|
| Cultural Preservation | .0106*** | .0088*** |
| | (.0031) | (.0025) |
| Wilderness Preservation | .0147*** | .0127*** |
| | (.0037) | (.0031) |
| Water Quality | .0379*** | .0331*** |
| | (.0051) | (.0045) |
| Visitation | -.0021 | -.0027 |
| | (.0034) | (.0030) |
| Tax Change | -.0097*** | -.0081*** |
| | (.0016) | (.0014) |
| No Species Protected | -.9385*** | -.7083*** |
| | (.1311) | (.1084) |
| Two Species Protected | .4827*** | .4831*** |
| | (.1194) | (.1038) |
| Four Species Protected | .8658*** | .7819*** |
| | (.1249) | (.1099) |
| ASC for *status quo* | -.3181*** | -.3552*** |
| | (.1088) | (.0975) |
| N | 7419 | 4329 |
| Log likelihood | -4003.46 | -2383.05 |

[8] The main results are not changed much if the ASC is excluded. The most important difference is that the estimated willingnesses to pay for cultural and wilderness preservation shown in Table 4 are higher by 20 – 55%, although the estimated tradeoffs between cultural and wilderness preservation aren't changed much.

Surprisingly, standard errors are lower when only explicit rankings are used, despite the smaller sample size. This may be due to a scale effect: if respondents are better at ranking more-preferred options, then in the rank-order logit model the scale of coefficients (see Swait and Louviere 1993) may be different as respondents move through the rounds of our tournament design; similarly, the scale of coefficients may be different for the implicit rankings than for the explicit rankings. This issue is worth further investigation, but differing coefficient scales will not affect ratios of coefficients (since the scale parameter will cancel out), which is our main focus.

The similarities of the coefficients on attributes across the various specifications displayed in Tables 2 and 3 suggest that the implied tradeoffs between various pairs of attributes might also be quite similar in magnitude. Since we are particularly interested in tradeoffs respondents are willing to make between cultural resource protection and natural resource protection, we calculate the following marginal rates of substitution (MRS): between wilderness preservation and cultural preservation, between the protection of one extra endangered species and cultural preservation, between water quality and cultural preservation, between cultural preservation and taxes, and between wilderness preservation and taxes; the last two of these are the marginal willingnesses to pay (MTWP) for cultural and wilderness preservation. Table 4 lists the results.

The estimates in the first row of Table 4 indicate that respondents are willing to give up a little more than 1 percent of the cultural preservation at North Cascades National Park in order to achieve a 1 percent increase in wilderness preservation, although the point estimates are not statistically significantly different than 1. According

## *Table 4*
Tradeoffs Between Attributes

| Tradeoff | All rankings | Explicit rankings only |
|---|---|---|
| MRS between wilderness and culture | -1.39 (.51) | -1.43 (.52) |
| MRS[1] between species and culture | -45.65 (15.91) | -54.68 (17.62) |
| MRS between water quality and culture | -3.58 (1.16) | -3.75 (1.18) |
| MWTP for culture | 1.09 (.35) | 1.10 (.34) |
| MWTP for wilderness | 1.52 (.35) | 1.57 (.36) |

to the point estimates for the tradeoff between endangered species protection and cultural preservation, respondents would be willing to give up around half of the cultural preservation in the park in order to protect grizzly bears in addition to bald eagles; a 1 percent increase in water quality is worth about a 3½ % decrease in cultural preservation. These tradeoffs are statistically significantly greater than 1. Respondents are willing to pay about 1½ times more for wilderness preservation than for cultural preservation, though the difference is not statistically significant.[9] Both willingnesses to pay are between $1 and $2 for a 1 percent increase in preservation. All of these results suggest (weakly, due to large standard errors) that respondents value the protection of natural resources more than the protection of cultural resources.

Whether using the whole sample or only the explicit rankings, there is no statistically significant difference between the tradeoff estimates in the nonusers and

[9] The Wald test p-value is .35.

users groups.[10] Similarly, except in one case (the MWTP for wilderness preservation) the differences between tradeoffs estimated using the whole sample or just the explicit rankings are not significant at the 5% level. As expected, however, the standard errors of the tradeoffs are typically smaller (though not by much) when implicit rankings are included.

## Summary

The tournament-style contingent ranking survey we introduced in this paper provided a rich amount of information. Including the rankings that are implicit in respondents' choices alters the rank-order logit coefficients but has little effect on the resulting point estimates of tradeoffs between attributes that respondents are willing to make, while decreasing standard errors. These promising results suggest that further investigation is warranted. A study that explicitly compared a tournament-style design to the usual design would help determine the relative efficiency of the former. The same study could also investigate whether the tournament-style design has any impact on respondent consistency. Additionally, the tournament-style design may have implications for the experimental design of the contingent choice scenario options, an issue that has yet to be addressed. Similarly, the econometric specification used to estimate the model should be explored further, especially once respondent consistency is better understood:

[10] When nonrubust, nonclustered variance-covariance matrices are used, the MWTP for wilderness preservation is statistically different at the 5% level for users and nonusers. All results are available from the authors upon request.

the tournament-style design may imply something about how the error term in the underlying random-utility model evolves through rounds of the tournament.[11]

Results indicate significant nonuse values for both natural and cultural resource preservation. No statistically significant differences between users and nonusers were found, suggesting that nonuse values dominate. Respondents in general seem to value the protection of natural resources more than the protection of cultural resources, but both are valuable. In particular, respondents value water quality and endangered species protection more than cultural preservation; wilderness preservation was also valued slightly more than cultural preservation. These kinds of results can help park managers decide how to allocate their scarce resources (see Turner 2013 for a discussion of how contingent choice surveys can be used in park management decisions). The particular results of this paper suggest that managers at North Cascades National Park are correct to emphasize both natural and cultural resource protection. Although it appears that natural resources are valued slightly more highly than are cultural resources, both kinds of resources create significant nonuse values. Park managers could make more economically efficient decisions about resource management by comparing the estimates of relative nonuse values to the relative costs of protecting different park resources. They could also use the estimates of values as justification for budget requests.

[11] Preliminary investigation shows no statistically significant effect of a set of dummy variables indicating which round of the tournament a particular choice set was in, but this issue deserves further study.

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