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"Mixed signals: Stated preferences for future states of three New Zealand rivers"

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Abstract
We conducted an online choice survey to inform advice to the Tasman District Council on setting management objectives for multiple uses and values across several catchments. One sub-sample was recruited via a survey company and a second via a public call with prize draw. From a survey with unlabelled choice sets for three rivers, we estimated a separate model for each river. Coefficients for natural character, fish & fishing, local jobs and cost were generally significant and had expected signs. Coefficients on swimming and boating attributes were weak even though 68% and 31%, respectively, of the panel sample reported engaging in these activities. Levels of attributes varied for the three rivers and, together with within-sample variation, made cross-river comparisons challenging. Latent class analysis was used to assess non-attendance with interesting results. The panel and public sample results highlighted the effect of random versus non-random sampling.

1.1. Introduction

Decision making about changing the use of a region's freshwater resources in New Zealand was largely delegated by central government to local authorities under the Resource Management Act (RMA) in 1991. Applications to abstract from or discharge to a specific water source are typically considered on a case by case basis and if contentious and or involve the public interest, which is usually the case, often lead to a highly charged, acrimonious and litigious process pitting different sectional interests against each other. This has led to a polarisation of positions, mistrust and misunderstandings making it extremely difficult to obtain outcomes that lead to an increase in net welfare taking into account cultural, economic, environmental and social values.

Recognising the limitations and divisiveness of the governance systems has led to the development of processes with greater stakeholder engagement through an increase in collaborative governance and participatory decision making. This was embodied in the New Zealand government's 2009 initiative on a New Start for Freshwater which has been subsequently aligned with the report of the Land and Water Forum – a Fresh Start for Freshwater (2010). These initiatives are a start and there is an ongoing effort to obtain consensus among the key stakeholder groups on the major policy issues at both the national and regional levels.

A key to improved stakeholder participation in decision making is a more structured approach such as the iterative and interactive process known as Deliberative

Multicriteria Evaluation (DMCE). Such tools require adequate scientific and other information, which is often uncertain and highly contested. The “other” credible information required is on social, cultural and economic impacts, which is much less available (Lennox, Procter and Russell, 2011). This paper focuses on a gap in the “other” information that is needed for better decisions on water resource allocation. Specifically, this means information about changes to the non-market values of freshwater when policy changes, such as recreational uses and natural character plus jobs as an economic indicator.

1.2. Choice Modelling

In August 2011, as part of the Valuing Our Waters project, Cawthron, Nimmo-Bell and University of Waikato researchers conducted an online survey on the future of rivers in Tasman District. The survey asked questions regarding specific reaches of three rivers: the Takaka, Matakitaki and Lee-Wairoa-Waimea. Using commercial survey firms to secure as representative a sample as possible, 274 people (“panel sample”) were recruited from Tasman District (127) and Nelson City (147), the latter being a separate but adjoining jurisdiction and hence home to many users of rivers in Tasman District. The survey was also advertised publicly, attracting 120 additional respondents (“public sample”) with 58 from Tasman District and 62 from Nelson City.

Table shows the demographics of the two samples, and in particular the stronger interest group focus of the public sample. Online panels tend to skew toward females, younger people with higher education (which was the case here), but tend to have a shortage for older age group and those who are less internet savvy (Research Now, *pers. comm.*).

Table 1. Self-reported activities of panel and public respondents to Tasman rivers choice survey as per cent of samples.

Self-reported activities	Panel %	Public %
Female (51% of local population)	69	43
Maori (7% of local population)	4	2
Env & Conservation groups	8	38
Farming involvement	21	32
Boating	31	45
Fishing	35	32
Swimming	67	67
Walking/picnicking	74	87

In order to draw valid conclusions about the population from the survey it is important to have a representative sample. In addition, as benefit transfer is a potential use of the survey results it is important to have a good description of the sample and population characteristics as valid benefit transfer requires the sites and populations of both source and target to be similar (Rosenberger and Stanley 2006). The more the target site and population are different to the source of the data, the more value estimates can be expected to diverge (Morrison and Bergland 2006). A key variable that influences the WTP results is income (Bateman 2009). The income characteristics of the samples (panel and public) compared with the population are shown in Table 2. As expected, low income people are under-represented. As a result, the WTP estimates from the samples are likely to be somewhat higher than that expected of the overall population.

Table 2. Income characteristics of the samples compared with the population (per cent)

	Panel	Public	Population
Less than $30,000	16	20	30
$30,000 to $50,000	27	19	19
$50,000 to $70,000	19	19	15
$70,000 to $100,000	18	17	12
Greater than $100,000	11	13	10
Prefer not to say	9	12	14

The survey also asked respondents about their active participation in recreational activities associated with rivers. For all activities, the number of active participants who were not members of clubs outnumbered those who were. For the panel sample, the non-member / member percentages were: boating 29% / 2%, fishing 35%, 0.4%, swimming 64% / 3% and walking 70% / 5%. The percentage of club members for the public sample were generally higher than the panel, but still a significant minority: boating 28% non-member and 17% member, fishing 32% and 0.8%, swimming 66% and 2%, and walking 77% and 10%. Based on this picture, researchers and decision makers should be wary of assuming club members speak on behalf of all those who participate in a particular activity. The majority of active participants may have different views to club members.

The purpose of the survey was to estimate the relative value to residents of changes in different attributes ("values") of rivers. It was hoped that this would provide additional context for comparing assessments in which these values had been considered separately using the River Values Assessment System (RiVAS) (Hughey and Baker, 2010). The RiVAS methodology develops, for each identified river use or value, a multi-criteria analysis using attributes and indicators of that value to score rivers within a region for their significance. Rivers are then ranked and grouped, based on their scores, into rivers of "national, regional and local significance" (or, in some cases, high, medium and low significance) for a given value.

RiVAS has applied to several uses and values in Tasman District: swimming, native birds, salmonid angling, kayaking, natural character and irrigation, and assessments for native fish and Maori values are underway. The choice survey was intended to help inform the relative priority that should be given to one or more of these uses and values when not all can be fully accommodated on a particular river. As will be discussed later, this proved to be difficult.

1.2.1. Survey methodology

The Tasman rivers survey asked respondents, for each of multiple questions, to choose between the status quo condition of a specified river segment and two alternative states. The state of rivers was described in terms of four attributes:

- swimming, measured in days suitable during summer
- boating (including kayaking), measured in days suitable Sept-May
- native fish and fishing:, poor, fair, good, excellent
- natural character: highly modified, mixed vegetation, mostly natural, all native species

Table 1 shows the status quo conditions for the three rivers.

The future river scenarios (alternative states) had two additional attributes: changes in local jobs, ranging from 200 fewer jobs to 200 more, and changes in local rates (property taxes), ranging from $150 less to $200 more, per year for five years. The levels of all six attributes were randomly mixed for different respondents, and presented in random order, to generate a diverse set of choices and increase the power of the statistical analysis.

Table 1. Status quo conditions for choice survey on three Tasman rivers, including ranges for swimming and boating attributes.

Attribute	**Lower Matakitaki**	**Lower Takaka**	**Lee-Wairoa-Waimea**
Swimming (days suitable)	50 (38 – 75)	80 (40 – 100)	80 (40 – 100)
Boating (days suitable)	175 (85 – 220)	160 (80 – 200)	140 (105–210)
Fish and fishing (suitability)	Excellent	Fair	Fair
Natural character	Mostly natural	Highly modified	Highly modified
Jobs in local area	No change	No change	No change
Property taxes	No change	No change	No change

Fish and Natural Character were constrained to not change in opposite directions (If FISH < 0, then VEG $\leq$ 0; If FISH > 0, then VEG $\geq$ 0), but otherwise the choice sets were randomly generated.

The attribute levels were colour-coded in the survey instrument to facilitate cognitive processing in what was a quite demanding survey in terms of the amount of information respondents were expected to process. Starting with the lowest or worst outcomes and moving “up”, the attribute cells were coloured orange, light orange, yellow, light green and dark green, respectively. See Figure 1.

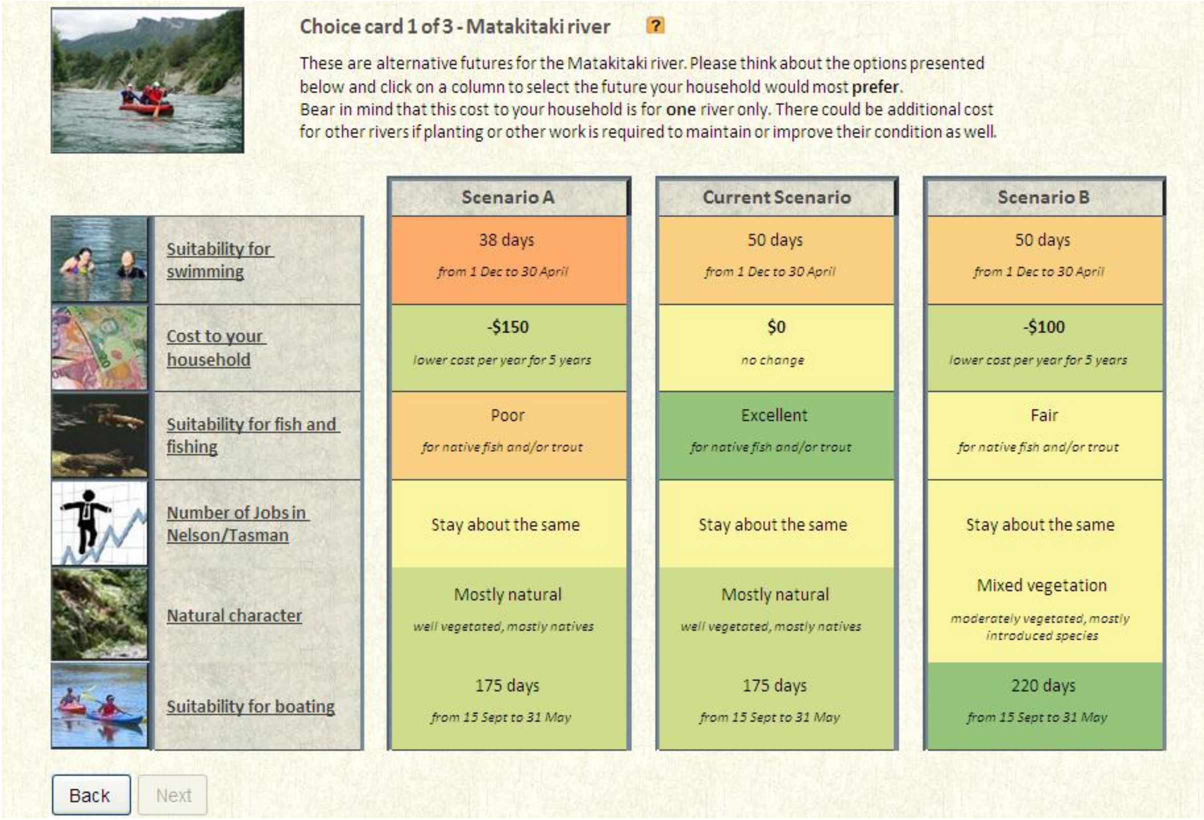

Figure 1. A choice card for the Matakitaki River, showing colour coding of attribute levels.

1.2.2. Experimental design

Using statistical regression techniques, respondents' preferences for the above attributes were estimated for each of the three rivers.

Due to limitations on time and budget a decision was made to use an expert panel rather than focus groups to elicit the key environmental and social attributes of each river including the ranges for each of these attributes. This was to have consequences later and is discussed in the results section below. The panel along with colleagues and friends were used as a convenience sample to test the questionnaire and to elicit priors for the coefficients that were used to develop an efficient survey design. In addition, the results of a test sample (first 50 responses) were used to further improve subsequent design in a Bayesian efficient two stage approach. An issue for the design was a lack of statistical significance for swimming and boating. This was accommodated by using a wide range on the priors for these two attributes.

Using a Bayesian efficient design recognises the uncertainty in existing knowledge about relative taste intensity (Ferrini and Scarpa 2007). It optimises efficiency for a range of parameter values rather than for a point estimate for each parameter. Unless the ex-post parameter value is exactly equal to the prior estimate, a Bayesian design is expected to result in better model fit and require a smaller sample size for a given level of precision. The Bayesian experimental design used the normal distribution for the coefficients derived from earlier sampling (convenience and first stage). This resulted in an experiment that had a good explanation of the model for the relatively small sample size that budget constraints allowed. The design was specific to WTP estimation (C-efficiency) by using the criterion of minimising the sum of the variances of the marginal WTP of each attribute (Scarpa and Rose 2008). This means that the design was structured to provide the best estimates of WTP rather than, say, the coefficients for each parameter.

The design was generated using Ngene (ChoiceMetrics 2009) and resulted in 18 choice sets for each of the three rivers making a total of 54. These were randomly divided into 6 groups resulting in a manageable grouping of 3 choice sets per river per respondent making a total of 9 choice sets per respondent. A benefit of on-line surveying is that the time taken to complete the questionnaire can be recorded. In this case the average time to complete the survey was recorded as 16 minutes. Each river had a separate efficient design. The 6 groups of choice sets were uniformly distributed in each survey sample resulting in each group of choice situations being more or less represented equally.

1.2.3. Data collection

The draft of the survey choice sets was first tested with a small convenience sample at the end of July 2011. Based on feedback, amendments were made to the survey and the priors were used to improve the survey design, which was made available to 150 people on the panel on 5 August. This stage closed on 9 August with the objective of obtaining 50 responses. After further refinement and updating the priors, the main survey was released to the panel on 11 August. The next 50 responses were utilised to update the priors again and the remainder of the panel given access to the survey on 18 August. Potential respondents were offered a $10 coupon incentive if they completed the survey satisfactorily and before the close-off date.

Advertisements for the public sample were run in local newspapers and on the Tasman District and Nelson City Council websites by 20 August. Both councils also included the call for public responses in their newsletters which meant that every household in the District and City would have received the advertisement in their mail. In the public sample the incentive offered was the chance to win one of five $50 cash prizes.

Potential respondents would have had a minimum of two weekends to complete the survey, which closed on 7 September 2011.

For the panel sample, quotas were initially set by age classes and level of higher education. When the total pool of potential respondents provided by the survey firm had been canvassed, these quotas had to be relaxed to achieve the target of 150 responses for both Tasman and Nelson.

The possibility of respondents completing the public survey multiple times in order to increase their chance of receiving a prize or to favour a special interest group was raised with the online company. Only some comfort was obtained from them as while computers sharing the same internet connection/modem would share the same IP address, if some respondents accessed the survey using different PCs in the household it would not be picked up by the blocking technology (Optimus). It appears that the reality of the online surveying is that nothing can stop respondents from accessing the survey multiple times if they are prepared to go to trouble to do so. But by removing those who sped through the process or provided uniform replies, removing duplicate respondents using their names and email addresses, as well as checking IP address, it is possible to weed out most of the fraudulent cases.

A feature of the panel was the low numbers of potential respondents in the catchments of Matakitaki (Murchison Ward) and Takaka (Golden Bay Ward). In order to overcome this deficit another survey company was hired to recruit 15 completed responses in each of these two areas (which would have been proportionate to the populations in each of these areas for the sample as a whole). In spite of 73 people agreeing via telephone to participate, only 16 did so, of which 11 were from Murchison and 5 from Golden Bay. Given this low number of completes from these two areas we chose not to analyse responses by location of respondent.

1.2.4. Sample characteristics

The final make-up of the samples is set out in Table 4. It is interesting to note that while difficulty was encountered in obtaining respondents from Murchison and Golden

Bay for the Panel, the reverse was true for the Public sample, particularly for Golden Bay.

Table 4. Respondent numbers by area for both the Panel and Public samples

	Panel	Public
Tasman District (total)	127	58
Tasman	99	14
Golden Bay	13	27
Murchison	15	17
Nelson City	147	62
TOTAL	274	120

For the choice questions, when asked how easy it was to select their preferred choice on a 1 to 9 scale with 1 being very difficult and 9 being “very easy” the weighted average score was 6.0 for the panel and 5.0 for the public sample indicating a moderate degree of ease. The scores for understanding were higher using the same scale with 1 being disd not understand at all and 9 being “completely understood”. The panel had a weighted average score of 6.8 and the public sample 6.7, indicating a good level of understanding. Figure 2 shows the responses to the two questions. The broader range on ease of making the choice along with higher scores for understanding give confidence that respondents understood the choice questions but had to think before making their choice. This suggests the survey succeeded in posing choices at the margins of respondents’ preferences.

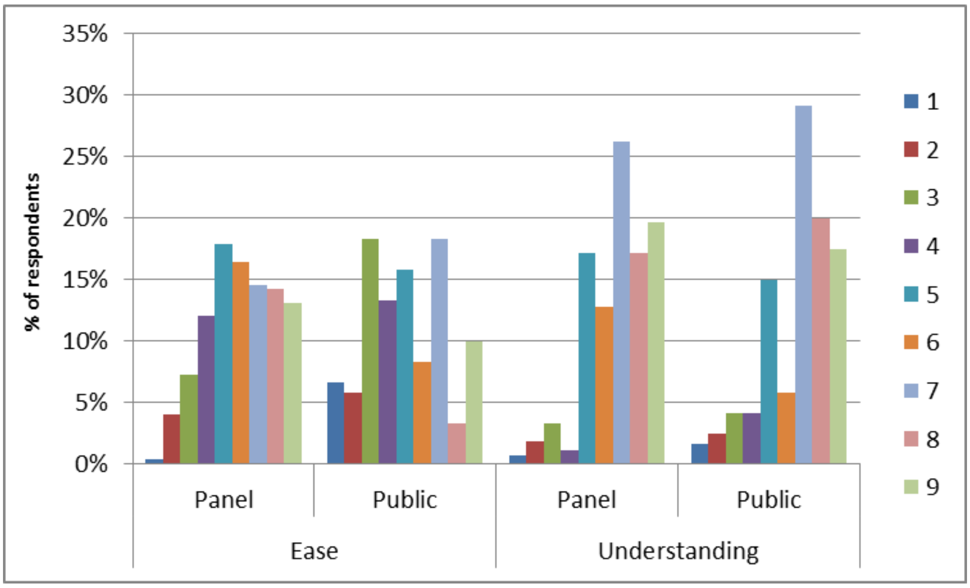

Figure 2. Ease of making the preferred choice and Understanding of the choice question: 9 being “very easy” and “completely understood” respectively

To provide an indicator of familiarity, respondents were asked how many times they had visited each of the rivers. There was an over whelming number who had never visited or had only visited one to two times. The Matakitaki was least visited (never

64% panel and 48% public or 1-2 times 28% and 33% respectively, together 92% and 81% respectively). Most visited was the Takaka (public sample). A notable feature was a very high number of visits to the Matakitaki by nine respondents in the public sample (see Figure 3).

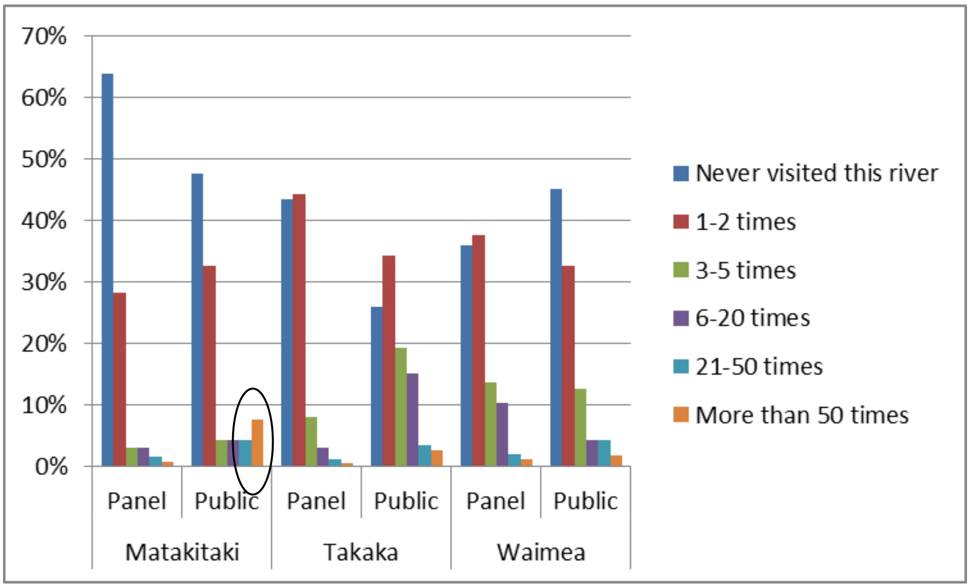

Figure 3. Visits to each river (percentage by category)

There was a higher proportion of the public who were active users of the Takaka and the Matakitaki while the panel sample was more active on the Waimea. The more popular activities undertaken by people who visited the Waimea and Takaka were walking, swimming, viewing the scenery and picnicking. A key feature of usage on the Matakitaki was the relatively high level of boating reported by the public sample (see Figure 4), not surprising since this river is known for kayaking and rafting opportunities.

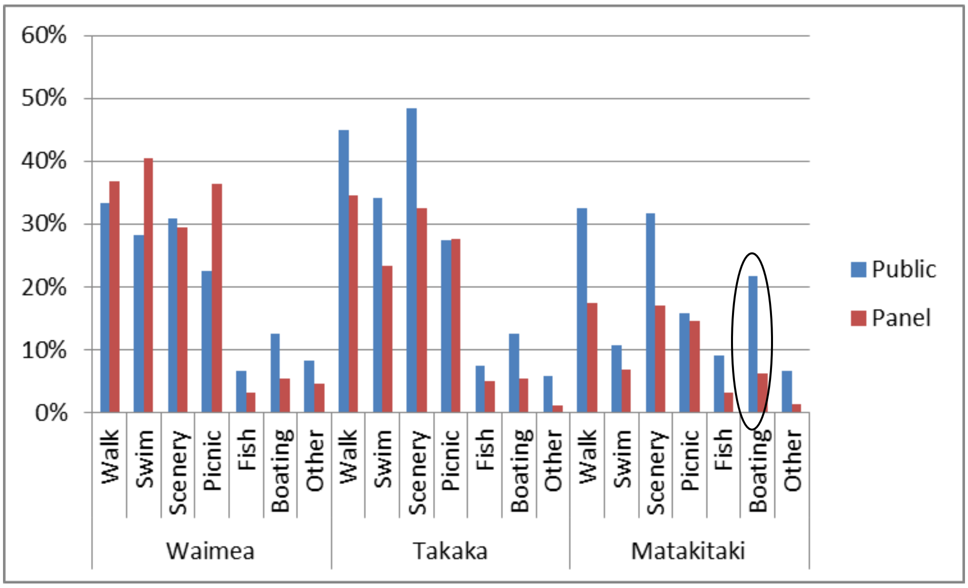

Figure 4. Activities undertaken on each river

After completing the choice questions, respondents were invited to comment on any aspect of the survey. Sixty nine per cent of the panel offered a comment compared with 94% of the public sample. For the panel there was a high level of positive comment, either thanks - 24% or thought provoking 17% (the public response was 6% and 4% respectively). In contrast the public sample had 47% of respondents (panel 10%) who were negative - either had difficulty or had a criticism of the survey design. Other significant comments included: would have liked more information re costs/jobs (panel 4%, public 11%), made a personal/political statement (5%, 9%), outlined their influences or motivations for filling out the survey (4%, 6%) and put forward their ideas on river management (1%, 6%).

1.2.5. Modelling

Because of differences in the composition of the two samples, as identified in the testing, and the higher level of self-selection bias inherent in the public sample, the analysis concentrated on the panel data.

A simple Multi-Nomial Logit (MNL) model was used initially to derive estimates of the coefficients for the attributes with each river in separate equations. This was followed by modelling using the Random Parameters Logit (RPL) also referred to as the Mixed Logit (ML) approach. The RPL model used normal distributions for the environmental and jobs attributes utilising the prior estimates while a triangular distribution was used for the cost variable. The parameters of the cost variable were restricted with the standard deviation equal to the mean thereby ensuring a logical sign on the cost coefficient (Hensher, Rose and Greene 2005, p614).

The RPL model provided consistently superior performance to the MNL model with a better fit to the data and generally greater numbers of attributes that were statistically significant.

Concerns about a general low level of statistical significance for the swimming and boating attributes led to testing for non-attendance on these attributes using the Latent Class (LC) model. The LC model was also used as a test for significance difference between the panel and public samples with the objective to determine whether it was sensible to combine these samples for analysis.

1.2.6. Results from choice survey

Using a t-test, no significant difference was found between the means of the attributes for the Tasman and Nelson sub-samples so these were combined for the purpose of analysis.

The panel data and output from the RPL model in most cases provided statistically significant coefficients for changes in natural character, fish & fishing, local jobs and property taxes. For example, the average willingness-to-pay (WTP) estimate was about $250 per year for five years (all WTP values are in NZ dollars) to avoid a change from excellent to good or fair in “fish and fishing” on the Matakitaki River, and about $600 per year to avoid a change to poor, although the variation within the sample increases with the larger changes. That is, there is quite close agreement within the sample on WTP of about $250 to avoid a change from excellent to good, but for a change to poor, the WTP ranges from $182 to $937 per year. Also, the mean value of $594 was the largest WTP for any change considered in the study. Estimated WTP for fish and fishing on the other two rivers showed a similar pattern but with lower values, as the status quo condition on these rivers is not as good and they are consequently less used for fishing.

Figure shows the results (using “Hensher draws”) for Fish and Fishing; all are statistically significant at 10% level or higher. The vertical line for each variable shows the average WTP and the range for 90% of respondents. A negative value indicates a respondent would need to have a reduction in taxes of the indicated amount to feel no worse off as a result of the change in suitability for fish and fishing.

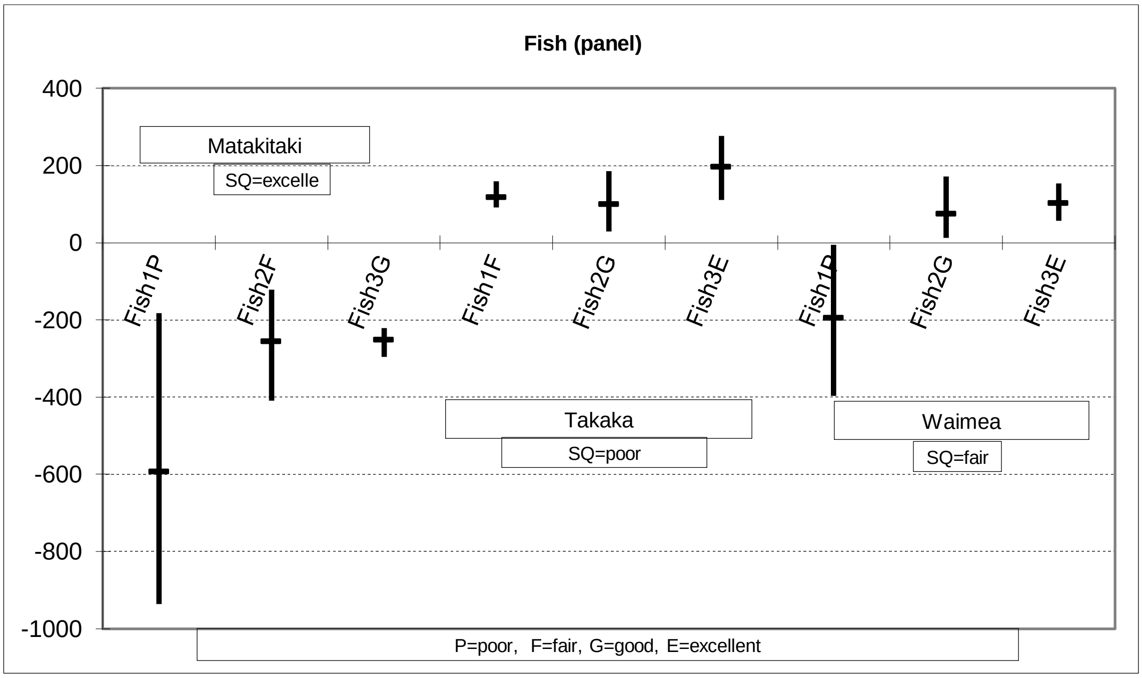

Figure 5. Estimated Willingness-to-Pay (mean and 90% range) for changes to "Fish and Fishing" on Tasman Rivers relative to status quo (SQ) condition, in dollars per year for five years.

WTP for Natural Character (Figure) has a similar pattern as Fish, with larger values and more variation the further one moves away from the status quo. Average WTPs for the largest changes from the status quo were consistent at around $200/per year.

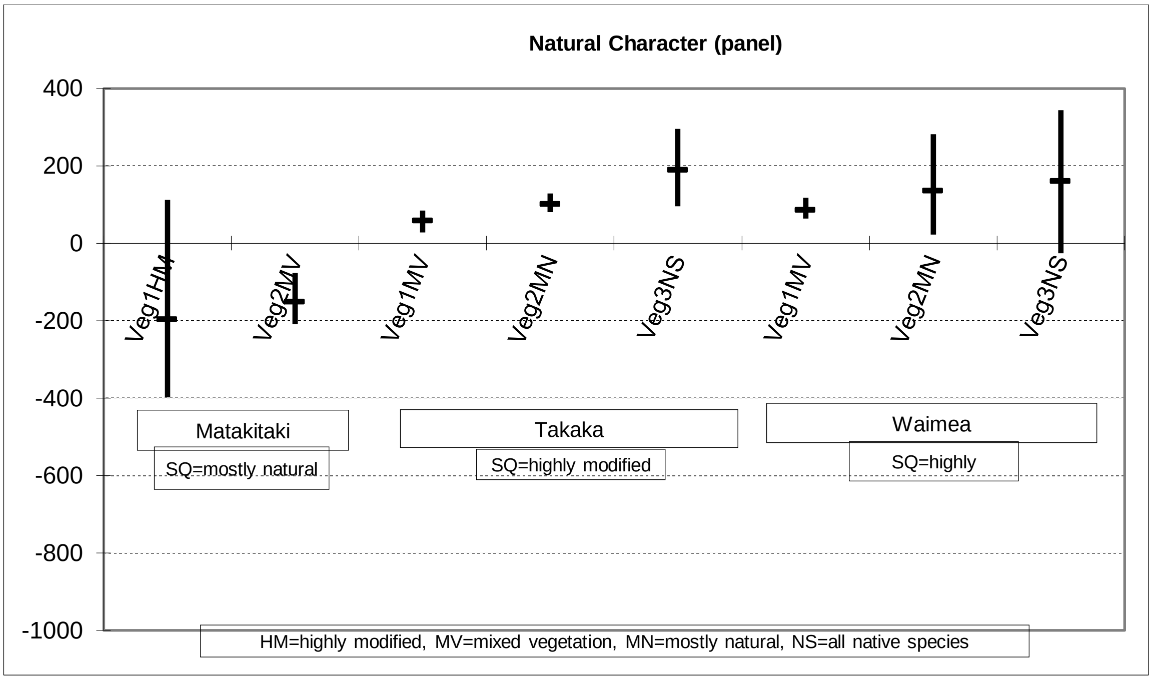

Figure 6. Estimated Willingness-to-Pay (mean and 90% range) for changes in Natural Character of Tasman rivers relative to status quo (SQ) condition, in dollars per year for five years.

For Jobs (Figure), there was greater concern for job losses than job gains on all three rivers, especially for the Matakitaki (WTP for loss of 200 jobs was -$472/year), though there was considerable variation in views.

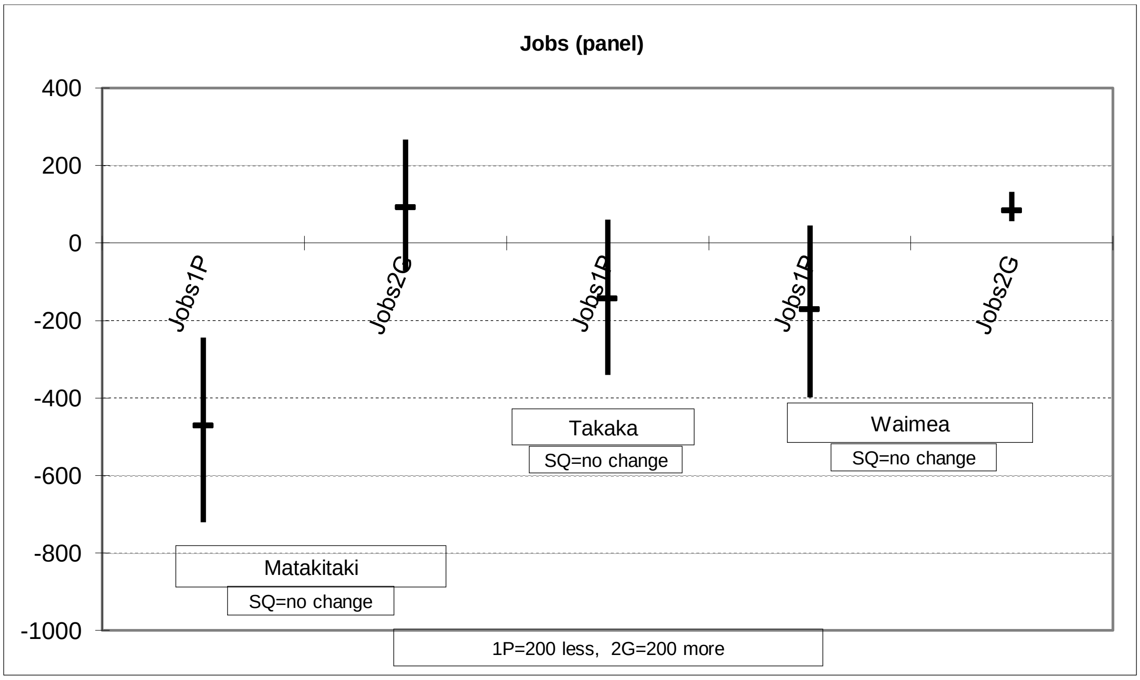

Figure 7. Estimated Willingness-to-Pay (mean and 90% range) for changes in local Jobs, in dollars per year for five years.

Coefficients on swimming and boating attributes were weak (not statistically significant or significant at less than the 5% level) even though 67% and 31%, respectively, of the panel sample reported engaging in these activities. This might have been due to the definitions used for these attributes. Respondents seem not to have found changes in “days suitable” for these activities to be meaningful, possibly because most do not envisage, for example, swimming or kayaking on a river anything like 120 days per year. Furthermore, as a stakeholder surmised at a presentation of these results, respondents might have had difficulty envisaging scenarios that would reduce by a number of days the suitability of rivers for swimming and boating. If the rivers had been described as “good, satisfactory or not satisfactory” for swimming and boating this might have elicited a stronger response especially if these conditions were linked to water clarity and/or bacterial contamination as was the case for a similar survey on the Hurunui Catchment in Canterbury, New Zealand (Marsh and Phillips 2011). Another possible explanation of the low attendance to swimming and boating is that many respondents may swim or boat primarily in the sea, which is a very accessible alternative for residents of Nelson and Tasman. .

Over 40% of panel respondents reported swimming in the Waimea and 23% in the Takaka, so it seems unlikely that they are not concerned about suitability of these rivers for swimming. However, only 5% of panel respondents reported boating on these rivers and 6% on the Matakitaki, compared with 13% of public respondents boating on the Waimea and Takaka each and 22% having reported boating on the Matakitaki. (Given the nature of these rivers, boating would mostly refer to kayaking, but might include some jet boating and rafting as well.)

A latent class model (LCM) analysis was used to identify non-attendance on cost and the boating and swimming attributes for the panel sample. The dataset for the LCM was constrained to the first response in each choice set as inclusion of the second response prevented model convergence. The four classes which resulted in convergence in the LCM included full attendance, ignore cost, ignore boat and ignore boat and swim. For the Matakitaki (Pseudo-R^2 of 0.206), the boat and swim attributes were ignored by 85% of the respondents with 15% showing full attendance. For the Takaka (Pseudo-R^2 of 0.109), the boat and swim attributes were ignored by 66% of respondents while 34% exhibited full attendance. For the Waimea (Pseudo-R^2 of 0.099), boat and swim was ignored by 64% of respondents, cost was ignored by 28% of the respondents with 8% showing full attendance. The LCM analysis shows that the attributes that had low levels of statistical significance (boating and swimming) also had low attendance levels. For most people boating and swimming were not considerations in their choices. Of those few who did not ignore boating and swimming the variability in responses results in low levels of significance.

Interaction variables with socio-demographics were not attempted because of the relatively small size of the samples.

1.3. Discussion

In this study there was an implicit assumption that natural character that is highly modified is bad while all native species is good as portrayed in the colour coding of the parameter levels in the choice sets (orange for highly modified through to deep green for all native species). This needs to be questioned as the demarcation of features such as naturalness, diversity, stability and resilience as “good”, while extinction of species and change as “bad” are subjective judgements and should be avoided (Kapustka and Landis 1998 and Lackey 2001). Hearnshaw, Cullen and Hughey (2005) concluded that there is no one phase or species assemblage within a system that is ecologically more important or better than another.

Ultimately it is society that determines what is “good” with the most appropriate means of characterising the preferred state of an ecosystem obtained through a set of criteria which reflects the subjective values of society (Costanza 1992; Sagoff 1995). Certain axioms of economic theory require that all social values and preferences concerning resource use are morally equivalent. Thus, decisions made concerning resource use should be determined solely in a market environment, as they follow the laws of supply and demand (Randall 1988).

In this study the expert group took on the task of defining the attribute and levels of natural character. With more time and budget the preferred approach would be to define these either through focus groups or as part of the survey process. The colour coding used was the same for each river, but it may be that the preferred state of natural character on one reach of a river would not be the preferred state on another reach of the river or for another river. As the colour coding may have influenced respondent WTP it may have been more appropriate to have no colour coding for this attribute.

If one puts aside the question of colour coding, the results support the *a priori* characterization of preferences for natural character consistently for all three rivers. On the Matakitaki respondents required a larger mean dollar paymentto be indifferent to a change from mostly natural to highly modified ($198) and a lessor mean amount for a change from mostly natural to mixed vegetation ($152). However, these differences were not statistically significant, For the Takaka River, respondents were WTP most for a change from highly modified to natural species ($189) and somewhat less for mostly natural ($100) and less again for mixed vegetation ($57). In this case, there is significantly less overlap between the 5 and 95 percentiles indicating clearer preferences between states. A similar picture emerges for the Waimea although the degree of overlap is greater than for the Takaka (see Table 5 and Figure 6).

The significance for decision makers is that while respondents were WTP for changes to natural character that moved in a progression from highly modified to mixed vegetation to mainly natural to native species, each step away from the status quo had a greater variation in WTP, i.e. a clear preference for a one step move, but less clear preferences the further away from the status quo. In addition there was a stronger negative feeling about a negative move than a positive feeling about a positive move. This conforms to expected behaviour.

Table 5. WTP for Natural Character – Means and 5 and 95 percentiles (dollars per year for 5 years)

	Mean	5%	95%
Matakitaki (SQ Mainly Natural)			
Δ to Mixed Vegetation	-152	-76	-210
Δ to Highly Modified	-198	112	-398
Takaka (SQ Highly Modified)			
Δ to Mixed Vegetation	57	28	85
Δ to Mainly Natural	100	80	129
Δ to Natural Species	189	96	296
Waimea (SQ Highly Modified)			
Δ to Mixed Vegetation	85	64	118
Δ to Mainly Natural	135	22	281
Δ to Natural Species	159	-26	344

1.4. Conclusion

As noted above, a primary motivation for this survey was to indicate relative priority to be given to several freshwater uses and values of Tasman rivers that were assessed separately. This proved difficult, however, because rivers are used differently depending on their character and their proximity to population centres. Further, the CM study examined strength of preference for changes in rivers, while the RiVAS method used for the earlier assessments focused on existing state. The choice experiment did not shed much light on how the other rivers in Tasman District should be managed for competing uses, but it is useful for considering alternative scenarios for the three rivers studied. Because CM surveys require clear and specific descriptions of how the environment might change, we conclude that the method is better suited for investigation of specific change scenarios than it is for investigating policy priorities across a diverse set of multi-use resources.

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Results for RPL models

	Matakitaki	Takaka	Waimea
Negcost	0.0035***	0.0064***	0.0084***
Swim1	0.0660	-0.4515***	-0.3069
Swim2	0.2195	-0.5716***	0.0713
Swim3	0.3943**	-0.4064**	0.5105**
Boat1	-0.1381	-0.2322	-0.0490
Boat2	-0.0264	-0.6186***	0.0999
Boat3	0.4443**	-0.5437***	-0.2233
Fish1	-2.0526***	0.7277***	-1.6149***
Fish2	-0.8905***	0.5544***	0.5743***
Fish3	-0.8683***	1.2328***	0.8235***
Veg1	-0.7573***	0.3743**	0.7061***
Veg2	-0.5572***	0.6235***	1.0716***
Veg3	0.1300	1.1373	1.3739***
Jobs1	-1.6882***	-0.9435***	-1.3441***
Jobs2	0.3527*	0.0819	0.6502***
SQ	0.6847**	-0.5189**	0.5594**
Model statistics			
N (observations)	1644	1644	1644
Log L	-1203	-1292	-1291
AIC (finite sample)	1.501	1.610	1.610
BIC	1.599	1.712	1.711
R^2 (McFadden)	0.334	0.285	0.285

Note: *, ** and *** denote significance at the 10%, 5% and 1% levels respectively

WTP estimates for attributes by river – means and 5 and 95 percentiles*
(dollars per year for five years)

Swimming

	Mean	5%	95%
Matakitaki (SQ Poor)			
∆ to Good	114	85	143
Takaka (SQ Fair)			
∆ to Worst	-73	-96	-59
∆ to Poor	-93	-119	-75
∆ to Good	-66	-85	-53
Waimea (SQ Fair)			
∆ to Good	85	64	118

Boating (kayaking)

	Mean	5%	95%
Matakitaki (SQ Good)			
∆ to Excellent	124	-42	286
Takaka (SQ Fair)			
∆ to Poor	-100	-133	-80
∆ to Good	-85	-134	-43

Fish and Fishing

	Mean	5%	95%
Matakitaki (SQ Excellent)			
∆ to Good	-252	-295	-221
∆ to Fair	-256	-410	-121
∆ to Poor	-594	-937	-182
Takaka (SQ Poor)			
∆ to Fair	117	91	159
∆ to Good	98	29	185
∆ to Excellent	196	111	277
Waimea (SQ Fair)			
∆ to Poor	-195	-397	-5
∆ to Good	75	12	172
∆ to Excellent	102	57	154

Natural Character

	Mean	5%	95%
Matakitaki (SQ Mainly Natural)			
Δ to Mixed Vegetation	-152	-76	-210
Δ to Highly Modified	-198	112	-398
Takaka (SQ Highly Modified)			
Δ to Mixed Vegetation	57	28	85
Δ to Mainly Natural	100	80	129
Δ to Natural Species	189	96	296
Waimea (SQ Highly Modified)			
Δ to Mixed Vegetation	85	64	118
Δ to Mainly Natural	135	22	281
Δ to Natural Species	159	-26	344

Jobs

	Mean	5%	95%
Matakitaki (SQ Fair)			
Δ to Poor	-472	-721	-243
Δ to Good	92	-72	267
Takaka (SQ Fair)			
Δ to Poor	-144	-341	60
Waimea (SQ Fair)			
Δ to Poor	-171	-398	46
Δ to Good	83	56	133

Note* Results for the panel sample using the RPL model. The means and ranges have been generated by simulating each coefficient for each respondent using 100 efficient Halton draws. This results in 274 WTP values of which the top and bottom 5% are screened out.