Salmonid Angling in Hawke's Bay: Application of the River Values Assessment System (RiVAS)

Kay Booth (Lindis Consulting)
Larissa Coubrough
Tom Winlove

LEaP Research Paper No. 16
July 2012
HBRC Plan No: 4374

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ISSN 2230-4207 (online)
ISBN 978-0-86476-305-1 (online)

Lincoln University, Canterbury, New Zealand

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Series URL: http://hdl.handle.net/10182/3410

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FORWARD BY EXPERT PANEL

This report is endorsed by the Expert Panel of anglers (below) as a first step in identifying the value of Hawke's Bay Rivers for salmonid angling.

However, the Panel acknowledges that data is absent for some rivers and severely outdated for others. Additional work is needed to be confident that the assessment reflects the current values of the wider angling community. The assessment is a best estimate only, given the limitations of existing data.

The Panel also states that this exercise is about the assessment of recreational angling value only and not the value of the fishery itself i.e. it doesn't take into account the importance of a stream for spawning or summer refuge, just angling value.

The assessment is primarily intended as an engagement tool to assist the Hawke's Bay Fish and Game Council in planning for more sustainable management of the region's rivers. The Resource Management Act 1991 (RMA) makes it clear that its purpose includes enabling people and communities to provide for their social wellbeing, of which salmonid angling is a part (RMA Part 2, section 5). The assessment is not intended to be used definitively in the RMA resource consenting process.

For more information on the appropriate application of this assessment please contact the Hawke's Bay Fish and Game office.

Peter McIntosh **John Cheyne** **Thomas Winlove**

Matt Osborne **Iain Maxwell** **John Scott** **Hans Rook**

1. INTRODUCTION

1.1 PURPOSE

This report presents the results from an application of the River Values Assessment System (RIVAS) for salmonid angling in the Hawke's Bay Region undertaken in December 2010. This is the second full application of the RIVAS for salmonid angling in New Zealand; the first was conducted in the Tasman District (Booth et al., 2010).

This application is based on the method outlined in Hughey et al. (2009). The Hawke's Bay Regional Council (HBRC) held a workshop on 13-14 December 2010 to apply this method to identified Hawke's Bay Rivers.

The application of the method for salmonid angling would be enhanced by research to inform underlying assumptions and replace out-of-date data (see Step 10).

1.2 PREPARATORY STEP: ESTABLISH AN EXPERT PANEL AND IDENTIFY PEER REVIEWERS

The Expert Panel for salmonid angling in the Hawke's Bay region comprised Iain Maxwell, John Scott, Peter McIntosh, John Chyene, Thomas Winlove, Matt Osborne and Hans Rook. Kay Booth (Lindis Consulting) facilitated the workshop. Martin Unwin, Neil Deans, Graham Sevicke-Jones, Larissa Coubrough and Adam Uytendaal acted as advisors. Credentials of members of the Expert Panel and the advisors are provided in Appendix 1.

2. APPLICATION OF THE METHOD

STEP 1: DEFINE RIVER VALUE CATEGORIES AND RIVER SEGMENTS

RIVER VALUE CATEGORIES

Expert Panel discussion confirmed that salmonid angling is very different in nature from other forms of fishing (e.g. whitebaiting). Because the Hawke's Bay does not provide salmon angling opportunities, this assessment relates to trout angling. Additional, separate, values assessments will be required to assess values associated with native fish and whitebaiting.

The Expert Panel also confirmed that the RIVAS method assesses only river angling values; lake angling values were not considered.

RIVER SEGMENTS

Work in advance of the meeting (by staff of the HBRC and Hawke's Bay Fish and Game) identified all river sections used for salmonid angling in the region. At the workshop a small number of rivers identified from the national angling surveys were added. This list gave 99 river segments on 91 individual rivers. It was considered to be a comprehensive stocktake of all angling waters and this exercise itself was felt to be useful (see Appendix 4a). Rivers not listed in Appendix 4a do not hold any present-day value for salmonid angling (survey data did not identify any angling use; the Expert Panel considered they had no known angling value).

Subsequent to the workshop, this list was refined – river sections which received very low use were deleted. This smaller list of rivers represents the main angling opportunities in the Hawke's Bay: 40 rivers subdivided into 47 sections (see Appendix 4b).

Several rivers were subdivided into reaches but the whole length of the river was also assessed (Mohaka, Ngaruroro and Tukituki).

The Expert Panel stressed the importance of environmental health of the fisheries, as this is fundamental to angling (no fish means no angling). However, discussion confirmed that the assessment was about recreational angling value – not the value of the fishery itself. Therefore, factors such as the importance of a stream for spawning were not explicitly considered.

This assessment pertains to present-day angling opportunities. The Panel recognised that angling value may change over time, for example, in response to changes in access provision and river degradation.

OTHER

In discussion, it was noted that the national angling survey provides a categorisation of rivers based on angling amenity: headwaters, backcountry, and lowland. Similarly, the Recreational Opportunity Spectrum provides a means to classify rivers: remote, natural, rural, and urban. Fish and Game was encouraged to undertake this classification as a subsequent exercise, to further characterise angling in the region.

OUTCOMES

- Confirmed salmonid angling as the focus of the assessment: specifically, trout angling.
- Collated an inventory of all river sections with known angling use (Appendix 4a).
- Derived a list of the main salmonid angling river sections (Appendix 4b).

STEP 2: IDENTIFY ATTRIBUTES

Attributes used to describe salmonid angling in the Tasman District assessment (Booth et al., 2010) were 'taken as given' for the Hawke's Bay assessment.

OUTCOME

- Confirmed the list of attributes (Appendix 2).

STEP 3: SELECT AND DESCRIBE PRIMARY ATTRIBUTES

The ten primary attributes used for the Tasman assessment were applied to Hawke's Bay Rivers. The Panel discussed the primary attributes at the beginning of the workshop to familiarise themselves and confirm that they felt the attributes applied to the Hawke's Bay. Most discussion focused on indicator thresholds (see Step 5) – the primary attributes were accepted by the Expert Panel members.

OUTCOME

- Appendix 2 describes the ten primary attributes considered in the Hawke's Bay assessment (in bold).

STEP 4: IDENTIFY INDICATORS

Indicators were adopted from the Tasman assessment. The ten indicators (one for each primary attribute) are given in Appendix 2. Appendix 3 shows the assessment of each indicator on SMARTA criteria.

OUTCOME

- Indicators are listed in Appendix 2 and assessed against SMARTA criteria in Appendix 3.

STEP 5: DETERMINE INDICATOR THRESHOLDS

The scoring thresholds developed for the Tasman assessment were applied to Hawke's Bay without any modification.

Attributes, indicator scores and associated threshold scores of relative importance (high, medium, low) are provided in Appendix 2.

OUTCOME

- Thresholds are identified in Appendix 2.

STEP 6: APPLY INDICATORS AND INDICATOR THRESHOLDS

Given that all indicators were assessed using primary data; this step involved entering data from the relevant data sources (primarily the national angling surveys). Data were kept in their original format (e.g. *actual number* of angler days, *percentage* of international anglers). About 50% of all river sections were populated with data in this way. Data for the remaining river sections were estimated by the Expert Panel (figures in bold italics). Relativity with other sections (where survey data were available) assisted in this task.

Discussion during this step included:

1. *Number of angler days:* Data is the average of three national angling surveys (2007/08, 2001/02, 1994/96). It was noted that it may be better to use the highest value from any one of these surveys, rather than the mean, as this will be influenced by unusual years (e.g. floods). It was confirmed that these figures relate to New Zealand resident anglers (not internationals).

   It was noted that the division of high use rivers into sections reduces the total number of angler days. For this reason, it was decided to list both the whole river as well as its individual reaches (where they differ in type of angling opportunity). See, for example, the Tukituki River (Appendix 4b).

   The thresholds were considered very high for the Hawke's Bay and consideration given to adjusting the thresholds for regional use levels. It was felt that a similar result would be likely if thresholds were switched to *% of total regional use* (c.f. current metric). It was noted that licence sales vary considerably per capita by region. Subsequently, the rivers were ranked using the established thresholds. The Expert Panel agreed that these provided a fair reflection overall of regional angling values.

2. *Intensity of use (mean free reach):* The calculation was adopted from the Tasman assessment:

   1 / (Length of reach (km) / Number of angling days in fishing season / Number of angler days p.a.)

   Expert Panel members supplied estimates of reach length from maps. This could be supplied more accurately from REC data (in advance of the workshop). The number of angling days was the same as that used in the previous indicator. The number of angling days in the season was supplied by Fish and Game. This metric assumes use is evenly spread across the reach.

3. *Travel distance:* It was noted that distances differ between regions – South Island anglers may travel much further than Hawke's Bay anglers. Most Hawke's Bay angling rivers are within 1.5 hours drive from Napier-Hastings. Therefore, it was questioned whether the thresholds might require regional adjustment. As with the number of angler days (above) the Expert Panel agreed to retain the established threshold scores as this provided acceptable overall rankings.

4. *Overseas anglers:* The indicator was the percentage of overseas angler days (of the total number of angler days). Some Hawke's Bay Rivers receive a lot of use by overseas anglers (e.g. Tukituki, Ruakituri, Mohaka). It was noted that the Hastings Anglers Club has hosted World Angling Championship qualifiers in the past, drawing guides and visitors to the area surrounding the Clubroom at Patangata.

5. *Perception catch rate & perception of fish size:* These two indicators were discussed together for each river. They represent the number of fish an angler expects to catch and the expectation of catching a large fish, respectively ('large' was not defined in the survey question, but the Expert Panel considered trophy fish). Data were taken from the 1979/80 national angling survey (Teirney and Richardson, 1992). Indicator thresholds represent the upper and lower bounds for 60% of all survey responses (on a normal distribution curve).
6. *Water quality:* The 5-factor calculation is provided in Appendix 4c. It was confirmed that this calculation included factors relevant to angling – not simply water quality per se. The Expert Panel endorsed this index. It was noted that water quality may vary through the fishing season. An 'average' was considered.
7. *Perception of scenic attractiveness & perception of wilderness:* These two indicators were discussed together for each river. Data were taken from the 1979/80 national angling survey (Teirney and Richardson, 1992). Indicator thresholds represent the upper and lower bounds for 60% of all survey responses (on a normal distribution curve).
8. *Perception of importance:* Data were taken from the 1979/80 national angling survey (Teirney and Richardson, 1992). The relevant question asks: Rate the importance of this river on a 1-5 scale.

Five of the ten indicators were populated by angler perceptions data drawn from the 1979/80 national angling survey (Teirney and Richardson, 1992). In all cases, a high score represents high value. These data are 30 years old. In a couple of instances the Expert Panel disagreed with them. Where this occurred, they were 'over-written' by estimates from the Expert Panel (figures in bold italics) – in all cases, this related to degradation of the reach over the past 30 years (which had dramatically altered the angling opportunity). Where these data for a reach were reliant on <15 respondents, the data is highlighted in blue.

For the *water quality* indicator, the HBRC supplied data that had been compiled using the index designed in the Tasman assessment.

OUTCOME

- Appendix 4 (a,b,c) presents all data, including a separate worksheet for the *water quality* indicator calculations and the 'grouped rivers'.

STEP 7: WEIGHT PRIMARY ATTRIBUTES AND RANK RIVERS

STEP 7A: WEIGHT PRIMARY ATTRIBUTES

The Expert Panel reviewed the ten primary attributes and considered whether some made a relatively greater contribution to the understanding of salmonid angling.

The indicator 'level of use' was weighted x2. Very little change occurred in the rank order of reaches, so the decision was made to keep weightings equal. The primary rationale was that data was not available to identify the relative contribution of each attribute to angling value.

STEP 7B: RANK RIVERS

The spreadsheet in Appendix 4b was used to sum the indicator threshold scores for each river or reach and then sort in descending order. This provided a list of rivers and reaches ranked by their value scores.

Review of this ranked list by the Panel identified that three river reaches stood out as under-valued (i.e. they were lower in the ranked list than the value ascribed to them by the Expert Panel). These were:

- **Hangaora River.** Discussed but no adjustment made to data.
- **Waiau River.** Discussed but no adjustment made to data.
- **Tutaekuri River.** Discussed but no adjustment made to data.

Reaches which appeared (to the Panel) to be over-valued in the assessment (i.e. they were higher in the ranked list than the value ascribed to them by the Expert Panel) were:

- **Taharua River**. Perceptions data based on 1 respondent and angling opportunity changed because of river degradation since 1979/80 survey. Data were reassessed by the Panel and new data estimates entered (blue highlight in Appendix 4b).
- **Wairoa River.** Receives a high level of use by guided international anglers. Likely that the river has been mis-labelled by anglers in the surveys – guides advising clients they were fishing "the Wairoa" when really elsewhere (Ruakituri). Data were reassessed by the Panel and new data estimates entered (blue highlight in Appendix 4b).
- **Aniwaniwa River.** Perceptions data based on 1 respondent. Expert Panel felt scenic attractiveness, wilderness character and overall importance scores were all too high; international anglers % was too low. Data were reassessed by the Panel and new data estimates entered (purple highlight in Appendix 4b).
- **Inangatahi River.** Perceptions data based on 6 respondents. Expert Panel felt scenic attractiveness and wilderness character scores were too high. Data were reassessed by the Panel and new data estimates entered (blue highlight in Appendix 4b).

At this stage of the workshop, the Panel agreed that it would be worthwhile deleting the less-used reaches from the list and ranking the main angling rivers only. This would 'clear out' the minor reaches and give focus to the important reaches. It was agreed that this exercise would take place subsequently, between HBRC and Fish and Game staff. Meantime, the Panel continued with the full 'inventory' list of all rivers.

OUTCOME

- Equal weighting. See Appendix 4b for weighting.
- River Indicator Threshold Scores summed and ranked by value (see appendix 4a-green column).

STEP 8: IDENTIFY RIVER VALUE FOR SALMONID ANGLING

Full inventory angling rivers list:

Hawke's Bay rivers of "High", "Medium" and "Low" overall value for salmonid angling were identified by applying rules to the ranked list of rivers (see Appendix 4b). The ranking rules applied in the Hawke's Bay assessment departed from the Tasman rules by ignoring the rule relating to *% overseas anglers*. In the Hawke's Bay, this indicator did not differentiate between rivers very well.

Attribute ranking rules applied by the Panel were:

- **"HIGH" angling value river** = 50% or more of the attributes = 3.
- **"LOW" angling value river** = maximum of one other attribute = 3.
- Remaining rivers were classified as **"MEDIUM" angling value**.

Using these rules, 10 reaches were assessed as high value, 27 as medium value and 62 as low value (see Appendix 4b).

The Panel agreed that the method effectively discriminated rivers' salmonid angling value. Only one river appeared to Panel members to be 'out of place' in the value assessment – the Tukituki River has been expected to rank as high value. The Panel suggested that this may be due to the weighting favouring back country rivers, where travel distances are greater. In Hawke's Bay, there are a lot of easily accessible lowland rivers, utilised by many local anglers but few international anglers that travel long distances. The Panel agreed that travel distance is less important in Hawke's Bay and should, therefore, receive a lower weighting. This further exercise was carried out by HBRC and F&G subsequent to the workshop.

Subsequent grouped angling rivers list:

Following a review of the initial rankings, the Panel applied two further weighting calculations to the grouped rivers data:

1. The importance of angler days was doubled. Revised rankings are summarised in the columns referenced 'Sum weight1' and 'Rank 1' in Appendix 4b; and,
2. Travel distance was removed from the equation, coupled with a doubling of the importance of angler days. These scores are reflected in 'Sum weight 2' and 'Rank 2' (Appendix 4b).

Subsequent attribute ranking rules applied by the Panel were:

- **"HIGH" angling value river** = rivers with a total score of >=22.
- **"LOW" angling value river** = rivers with a total score of <=15.
- Remaining rivers were classified as **"MEDIUM" angling value**.

Using these rules and weighting calculation No.1 (importance of angler days doubled), 17 reaches were assessed as high value, 23 as medium value and 7 as low value (see Appendix 4b in column 'Rank 1').

With respect to weighting exercise No.2, 11 reaches were assessed as high value, 22 as medium value and 14 as low value (see Appendix 4b in column 'Rank 2').

The Panel agreed that the subsequent grouped angling rivers list, weighted to remove travel distance from the equation, coupled with a doubling of the importance of angler days, presented the most accurate representation of salmonid angling value in the Hawke's Bay.

OUTCOME

- Rivers significance identified as high, medium, and low. See Appendix 4b (weighted rankings for grouped rivers).
- Rivers in the Hawke's Bay region not listed have either very low or no salmonid angling value.
- The set of rivers, mapped by significance level, is shown in Figure 1.

STEP 9: OUTLINE OTHER FACTORS RELEVANT TO THE ASSESSMENT OF SIGNIFICANCE

Seven attributes of salmonid angling have been identified which are not quantifiable but considered relevant to significance assessment. These attributes are discussed in Appendix 5 in order to highlight their importance to a meaningful understanding of salmonid angling. The attributes are:

- Access
- Degree of scarcity of the experience
- Contribution to a collective value
- Users' perceptions of the river's 'status'
- Potential future angling use
- Existence value
- Past use (former high quality angling rivers)

These attributes do not influence the numeric calculation of river significance, but are relevant to decision-making about salmonid angling.

OUTCOME

- List and description of non-measured attributes (Appendix 5).

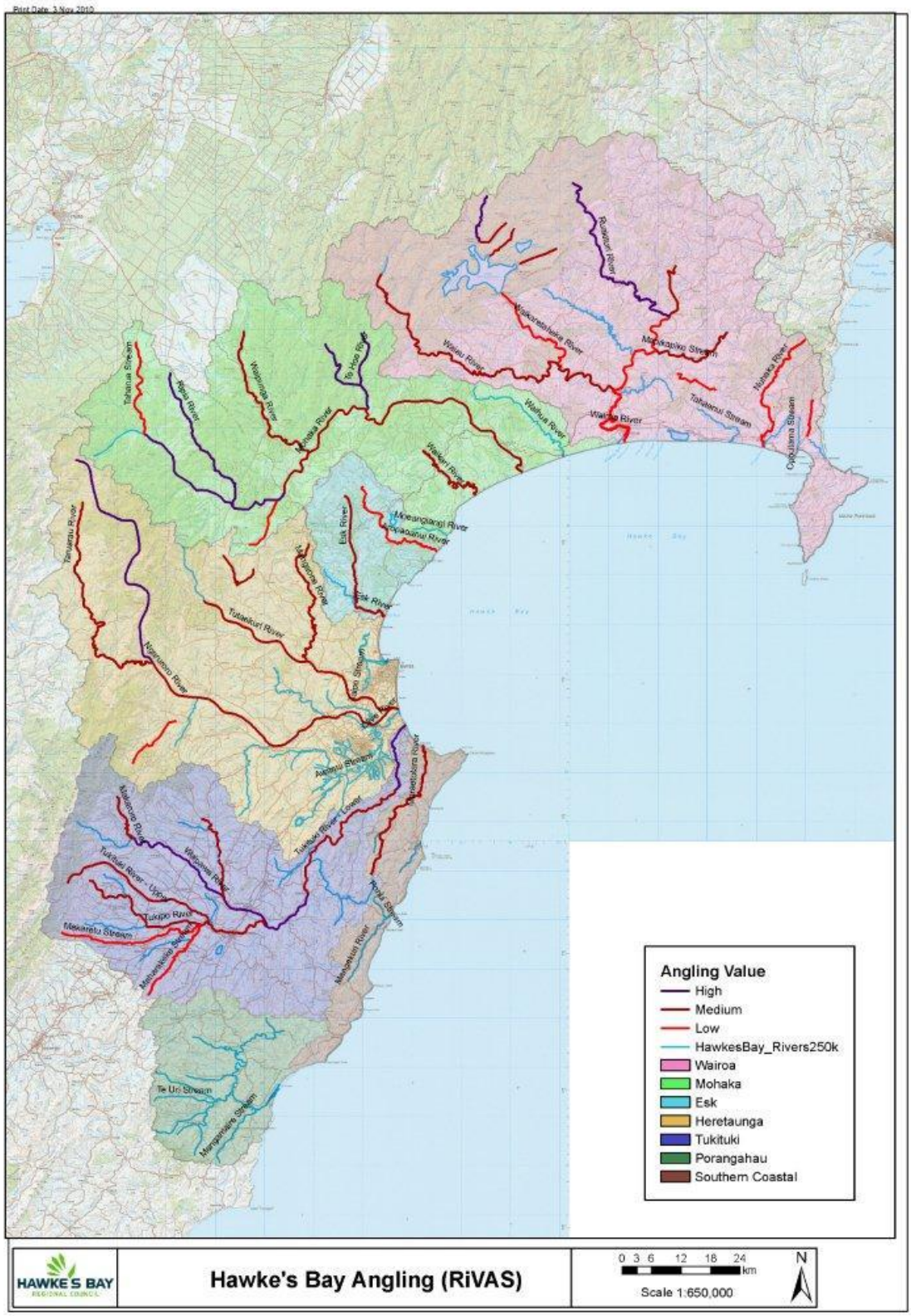

Figure 1: Hawkes Bay salmonid angling rivers mapped by significance level

STEP 10: REVIEW ASSESSMENT PROCESS AND IDENTIFY FUTURE INFORMATION REQUIREMENTS

The National Angling Survey provides a national angling database which greatly assists with indicator measurement (usage data). However data about angler perceptions' are out of date (30 years old). Half of the indicators relate to angler perceptions. For the Hawke's Bay, many rivers had a very small number of survey respondents which meant data were not reliable (this was taken into account during the assessment).

For future assessment, desired data are noted in Appendix 6.

ACKNOWLEDGEMENTS

This assessment was funded by the HBRC and the Hawke's Bay Fish and Game Council.

Development of the RIVAS method was funded by the Foundation for Science, Research and Technology as part of the project 'Developing a significance classification framework for water body uses and values'.

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APPENDIX 1: Credentials of the Expert Panel members and advisors

Expert Panel:

1. **John Cheyne** is a Freshwater Biodiversity Officer with Fish and Game's Hawke's Bay Region. He has specialised in wetland management for 23 years. John has extensive experience trout fishing across the Region's rivers and carrying out bird surveys with DoC and OSNZ.
2. **Iain Maxwell** is a Senior Freshwater Ecologist with the Cawthron Institute. He has 18 years experience in Salmonid fishery management, including management of the Lake Taupo fishery, Rotorua Lakes fisheries, and a decade in Hawke's Bay; finishing as a Regional Manager for Fish and Game New Zealand. Iain has written and peer reviewed many technical reports for Fish and Game New Zealand on the Hawke's Bay Region's fisheries. As a keen angler, Iain has also fished many of the Region's Rivers.
3. **Peter McIntosh** is the Fish and Game Regional Manager for Hawke's Bay.
4. **Matt Osborne** has been employed by Eastern Region Fish and Game in the role of Fish and Game Officer for five years. Matt has been involved in fisheries projects involving access, lakes and river surveys, and fishery health studies throughout the Region.
5. **Hans Rook** has been employed in Hawke's Bay for 27 years, first with the Wildlife Service (until 1987) and then with the Department of Conservation. He has extensive local knowledge on the District and has done a lot of Electro-fishing throughout the area. Hans has a depth of knowledge on the distribution of native and indigenous freshwater fish because of this.
6. **John Scott** has fished in Hawke's Bay for 40 years. He has been on the Hawke's Bay Fish and Game Committee for one term and has been a fishing guide for four years.
7. **Thomas Winlove** has been a Fish and Game Officer in the Hawke's Bay Region for four years. He has undertaken fisheries projects and research over that time, as well as being an angler for over 10 years.

Advisors:

1. **Dr Kay Booth (facilitator)** is an outdoor recreation researcher and planner. She is the Director of Lindis Consulting and, until recently, a Senior Lecturer in parks, recreation and tourism at Lincoln University. She is conversant with existing data about outdoor recreation. With colleagues, Kay developed the significance assessment method on which this application is based and facilitated the West Coast whitewater kayaking case study. She holds appointments on the New Zealand Walking Access Commission, the New Zealand Geographic Board and the New Zealand Conservation Authority. She is a novice whitewater kayaker.
2. **Larissa Coubrough** is an Asset Engineer at Hawke's Bay Regional Council (HBRC). She has a background in environmental planning and policy development in local government in New Zealand and in British Columbia, Canada where she was employed by the BC Ministry of Environment as a Water Policy Advisor. Larissa's work with HBRC includes assisting with the management of environmental studies associated with the Ruataniwha Plains Community Water Storage Project.
3. **Neil Deans** is manager of the Nelson Marlborough Fish and Game Region and has expert knowledge of all rivers and salmonid angling in the District in his field and other work over the last 20 years. He has written widely about sports fishery management, including as lead author of the chapter on Sport Fishery Management in the recently published 'Freshwaters of New Zealand'. He is the immediate Past President of the Freshwater Sciences Society of New Zealand and has produced a paper on evaluation of salmonid fisheries for Fish and Game New Zealand nationally.

4. **Graham Sevicke-Jones** is Environmental Science Manager for Hawke's Bay Regional Council**.** Graham has over 22 years experience as a scientist in local government. After graduating from Canterbury University Graham worked as an industrial chemist before taking up a science position in South Canterbury Catchment Board in water quality and ecology; an interest he continues with today. Graham has been involved in a number of water quality programmes furthering research and monitoring in NZ at a local and central government level. Graham is convenor of the Surface Water Integrated Management Group (SWIM), a special interest group within local government.

1. **Martin Unwin** is a fisheries scientist with over 30 years experience, based with NIWA in Christchurch. He has contributed to, or had oversight of, the four National Angler Surveys and other related angler surveys. He can access the data associated with these for the use of this analysis.

2. **Adam Uytendaal** is the Principal Scientist/Team Leader for the Water Quality and Ecology team of the Hawke's Bay Regional Council. Adam has over 15 years experience in the monitoring or management of freshwater resources.

APPENDIX 2: Assessment criteria for salmonid angling (Steps 2-4)

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
Step 2: Identify attributes Step 3: Select and describe primary attributes		Step 3: Select and describe primary attributes	Step 4: Identify indicators	Step 5: Determine significance thresholds	
ATTRIBUTES ASSOCIATED WITH EXISTING USE					
Users	**Level of use**	High use implies high value. However, this assumption will under-value special and remote places for several reasons, including: **Activity specialisation.** Resources suitable for highly specialised participants (high skill levels) will attract low numbers of users but may be highly valued and/or rare opportunities. **Access.** Restrictions upon access will reduce use and/or make it available only to some potential users due to cost, availability of time, specialised equipment or transport, physical capability, etc. **Wilderness and remote areas**. Areas that offer few encounters with other people may be highly valued for this attribute (amongst other things). This is particularly so for anglers, as other anglers represent not only a potential disturbance to	Number of angler days p.a. Notes: Ideally should be number of angler days per season, as some rivers are open to angling all year while others only for the main 7 month fishing season. Considered but dismissed an alternative indicator (angler days per km).	High: >5,000 angler days p.a. (**score: 3**) Medium: 1,000 - 5,000 angler days p.a. (**score: 2**) Low: <1,000 angler days p.a. (**score: 1**)	National Angling Survey: mean from 3 surveys (good)

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
		wilderness values, but also a competitor for a fishing opportunity which is affected by the presence of others. In NZ, evaluation of the significance of freshwater fisheries has gone further than most other forms of water-based recreation. A review of the first national angling survey undertaken in 1980 (Teirney and Richardson, 1992: 693-702, our emphasis) summarised this issue as follows: *The total number of fishing visits made to each river provided a measure of its relative importance. [However] the relative importance (and presumably therefore the absolute value) cannot be evaluated solely by reference to measures of angler use. A list of seven other factors believed to be important determinants of high-quality river fishing experiences in New Zealand was compiled… For each river, anglers were asked to assign a rating between 1 (lowest) and 5 (highest) for distance from home, ease of access, area of fishable water (defined as the area of river bed or bank from which to fish),*			

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
		scenic beauty, peace and solitude, catch rate and size of fish. The overall importance of each river fished was also evaluated with the same rating scale… *For trout rivers, our results suggest angler use alone should not be used as an absolute measure of a river's value; none of our three measures of angler use were correlated with anglers' perceptions of overall importance. The rivers used most in New Zealand tended to be close to home and have easy access, whereas the most highly valued rivers were characterised by good catch rates of large fish, extensive areas of fishable water, and scenically attractive and peaceful surroundings…* *It seems that the hope, even if unrealistic for many anglers, of landing a fish or having an occasional success weighs particularly heavily in the perception of a New Zealand river's value.*			
	Intensity of use	Intensity of use is measured by the Mean Free Reach (MFR), which is the length of the reach divided by the number of angler days. The smaller the MFR, the more crowded the river,	Mean free reach (MFR) = average distance (in km) an angler would have to travel on an average day before encountering another	High: MFR <5km (**score: 3**) Medium: MFR 5-20 km (**score: 2**) Low: MFR >20 km	National Angling Survey: 2007/8 (good)

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
		i.e., low values imply high density. It is an idealisation, based on the assumption that anglers are evenly distributed along the length of each river, but NIWA suggests the measure gives credible results. High density is taken as an indicator of high value.	angler. The calculation is: 1 / (Length of reach (kms) / Number of angling days in fishing season / Number of angler days p.a.)	(**score: 1**)	
	Level of commercial use				
	Origin of New Zealand users	Origin of users is suggested as an indicator of quality of the recreational experience, based on the assumption that the higher the expected quality of the experience, the greater the distance users will be prepared to travel.	Mean no. km travelled from home by NZ anglers Note: Actual metric is mean log travel distance in km from home address to river mid-point	High: >100 km (**score: 3**) Medium: 50-100 km (**score: 2**) Low: <50 km (**score: 1**)	National Angling Survey: mean from 3 surveys (good)
	Level of international use	Same as above.	% overseas anglers (of total number angler days)	High: >20% overseas angler visits (**score: 3**) Medium: 10-20% overseas angler visits (**score: 2**) Low: <10% overseas angler visits (**score: 1**) None: No use by overseas anglers (**score: 0**)	National Angling Survey: mean from 3 surveys (good)
	User demographics				
	Behaviour of users				

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
Activity	Activity specialisation (degree of skill required)				
Environmental setting: Fishery	**Anticipated catch rate**	Data (from the National Angling Survey 1979/80 and the 2008 FGNZ pilot survey) indicate that the attributes: perceptions of "catch rate" and "chance of catching a large fish": are important components of the angling experience. Both attributes could be assessed as *actual* or *anticipated* measures. The choice of users' perceptions (*anticipated* measure) for both attributes relates to the greater influence that users' perceptions have on their recreational behaviour (c.f. actual rates and chances).	User's perception of catch rate	High: >0.5 (**score: 3**) Medium: 0.2-0.5 (**score: 2**) Low: <0.2 (**score: 1**) Data result from the following calculation: Respondents to the 2008 FGNZ Pilot Survey were asked to identify the 3 most important attributes (from 8 possible candidates) which characterised each river they fished. Scores for each attribute were derived by expressing the number of respondents who listed that attribute as a proportion of the total responses for each river.	2008 pilot survey (good)
	Anticipated chance of catching a large fish		User's perception of chance of catching a large fish	High: >0.5 (**score: 3**) Medium: 0.2-0.5 (**score: 2**) Low: <0.2 (**score: 1**) Data result from the following calculation: See *Anticipated catch rate*	2008 pilot survey (good)

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
	Angling methods permissible				
	Area of fishable water				
	Species present				
	Species population				
Environmental setting: River features	Water characteristics (e.g. pool/riffle/run sequences)	Given that river features are usually the focus of the decision-making process for which this method will be implemented, ideally all attributes would be selected as primary attributes. However, this is not practical. Water quality was chosen because the water quality requirements of salmonids are well known and most rivers of interest have relevant water quality data			
	Flow (% river segment's length with water deeper than 1 metre, at summer low flow)				
	Water quality	In July 2010, the faecal coliform standard used in calculations of the water quality index was changed. The 2009 report used the 'alert standard' (260); in July 2010 the 'action standard' (550) was adopted.	Combination of 5 components: water temperature, oxygenation, faecal coliforms, clarity and macro-invertebrate community index	High: >0.8 (**score: 3**) Medium: 0.5-0.8 (**score: 2**) Low: <0.5 (**score: 1**) Data result from the calculations shown in Appendix 5 (worksheet	Tasman District Council & some Fish and Game data. Expert Panel estimates (fair).

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
		See Appendix 5 (worksheet labelled *Water quality calculations)*		labelled *Water quality calculations)*	
Environmental setting: Landscape	Degree of naturalness natural character				
	Scenic attractiveness	Identified in all of the (few) attempts to rate river recreation (National Angling Survey 1979/80 and the 2008 FGNZ pilot survey). As with wilderness character (see next), the measure is based on users' perceptions rather than professional judgment, as users' perception will influence behaviour and satisfaction. Generally, it is expected that there is a positive correlation between perceived scenic attractiveness and angling amenity.	Anglers' perceptions of scenic attractiveness	High: >0.5 (**score: 3**) Medium: 0.2-0.5 (**score: 2**) Low: <0.2 (**score: 1**) Data result from the following calculation: See *Anticipated catch rate*, above	2008 pilot survey (good)
	Wilderness character	This setting attribute has a positive relationship with wilderness angling – the higher the perceived wilderness character, the higher the angling value (National Angling Survey 1979/80 and the 2008 FGNZ pilot survey). Tierney and Richardson (1992) found that angling attributes directly associated with fishing (such as catch rate or fish size) accounted for less than 30% of perceived	Anglers' perceptions of wilderness character	High: >0.5 (**score: 3**) Medium: 0.2-0.5 (**score: 2**) Low: <0.2 (**score: 1**) Data result from the following calculation: See *Anticipated catch rate*, above	2008 pilot survey (good)

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
		fishery value.			
Social setting	Encounters with other anglers				
	Encounters with other users (not anglers)				
Managerial setting	Facility and services provision and regulation (e.g. bridges; air services)				
	Access: Provision of unrestricted public access; Access charges; Degree of difficulty (e.g. walk in)	See Step 9.			
Experiences	**Perceptions of the importance of the river**	Currently the National Angling Survey does not collect this information. A question could be added asking anglers to rate rivers in terms of its overall importance. This differs to the contextual value 'perception of the river's status' in that it is specific to users' perceptions – the latter value relates to the status by which the river is held by the recreational community (users and non-users). For example, the	Anglers' perception of the overall importance of the river	High: >4 on question scale (**score: 3**) Medium: 3-4 on question scale (**score: 2**) Low: <3 on question scale (**score: 1**)	1979 National Angling Survey (fair, owing to age of data) While there were more recent data for Otago and Nelson Marlborough, rankings were mostly similar but older data was more robust and a full national dataset

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
		Tongariro River is an iconic New Zealand rainbow trout fishery. It also differs to the angler's perception of the quality of their experience (see next attribute), as that is usually measured based on a single visit. This parameter refers to perception of the river in a general sense (long-term view).			
	Perceptions of the quality of the experience				
Other outcomes	Economic benefits: To local area, region, nation				
	Non-economic benefits, including existence value				
CONTEXTUAL ATTRIBUTES					
Opportunity *spectrum*	Degree of scarcity of the experience	See Step 9.			
	Contribution to a collective value	See Step 9.			
	Users' perceptions of the river's 'status'	See Step 9.			

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
ATTRIBUTES ASSOCIATED WITH FUTURE AND PAST USE					
Recreation *opportunity*	Potential future angling use (option value) - avoid precluding future uses	See Step 9.			
	Past use (former glory)	See Step 9.			

APPENDIX 3: Assessment of indicators by SMARTA criteria

Indicator	Specific	Measurable	Achievable	Relevant	Timely	Already in use
No. angler days p.a.	Yes	No. days	Survey data available	Use implies valued by user	Data available	Yes
Mean free reach	Yes	Fishable reach / angler days p.a.	Survey data available	High intensity implies high value	Data available	Yes
Mean no. km travelled from home by NZ anglers	Yes	No. km	Survey data available	Travel distance = indicator of quality of experience	Data available	Yes
% overseas anglers (of total number angler days)	Yes	%	Survey data available	Same as above (international travel)	Data available	Yes
User's perception of catch rate	Yes	Response to rating scale question	Survey data available	Known to influence choice of angling site	Data available	Yes
User's perception of chance of catching a large fish	Yes	Response to rating scale question	Survey data available	Known to influence choice of angling site	Data available	Yes
Combination of 5 components: water temperature, oxygenation, faecal coliforms, clarity and MCI	Yes	Combination of relevant components	Data available	Influences both fishery and quality of angling experience	Data available + some estimates	Yes
Anglers' perceptions of scenic attractiveness	Yes	Response to rating scale question	Survey data available	Known to influence choice of angling site	Data available	Yes
Anglers' perceptions of wilderness character	Yes	Response to rating scale question	Survey data available	Known to influence choice of angling site	Data available	Yes
Anglers' perception of the overall importance of the river	Yes	Response to rating scale question	Survey data available	Known to influence choice of angling site	Data available	Yes

APPENDIX 4a. Full list of rivers considered for the value salmonid angling, Hawkes Bay

River	Tributary of:
Oamaru River	Mohaka
Mohaka River (upstream of Mang. Confluence)	Mohaka
Hopuruahine Stream	Wairoa (Waikaremoana)
Kaipo River	Mohaka
Mohaka River (source to sea)	Mohaka
Ngaruroro River above Taruarau conf.	Ngaruroro
Ripia River	Mohaka
Te Hoe River	Mohaka
Ruakituri River	Wairoa
Hautapu River	Mohaka (Te Hoe)
Waiau River	Wairoa
Puneketoro Stream	Mohaka
Waipunga River	Mohaka
Tukituki River - Waipawa confluence to Patangata Bridge	Tukituki
Ikawetea Stream	Ngaruroro (Taruarau)
Tukituki River (source to sea)	Tukituki
Mangatutu Stream	Tutaekuri
Mangatainoka River	Mohaka
Taruarau River	Ngaruroro
Aniwaniwa Stream	Wairoa (Waikaremoana)
Manson Creek	Ngaruroro (Taruarau)
Harkness Stream	Ngaruroro
Kiwi Creek	Ngaruroro
Papoke Stream (Gold Creek)	Ngaruroro
Rocks Ahead Stream	Ngaruroro
Mohaka River (Mang. Confluence to SH5)	Mohaka
Waipawa River	Tukituki
Ngaruroro River (source to sea)	Ngaruroro
Tukituki River below Patangata Bridge	Tukituki
Matakuhia Stream	Mohaka (Waipunga)
Mokomokonui River	Mohaka (Waipunga)
Waiotukupuna Stream	Wairoa (Waikaremoana)
Mangatewai River	Tukituki
Tutaekuri River	Tutaekuri
Inangatahi River	Mohaka
Ihumeka Stream	Wairoa
Waikoau River	Aropaoanui
Mohaka River (SH5 to sea)	Mohaka
Tukituki River above Waipawa confluence	Tukituki
Mokau Stream	Wairoa (Waikaremoana)
Mangaonuku Stream	Tukituki
Hangaroa River	Wairoa
Mangapoike River	Wairoa
Toropapa Stream	Mohaka (Puneketoro)
Waikari River	Waikari
Kahahakuri Stream (Black Creek)	Tukituki
Ngaruroro River below Taruarau conf.	Ngaruroro
Kopuawhara Stream	Kopuawhara

Makino River	Mohaka
Makaretu River	Tukituki
Makaroro River	Tukituki (Waipawa)
Mangaone Stream	Wairoa
Otamauri Stream	Ngaruroro
Tutaekuri Waimate Stream	Tutaekiri
Tangarewai Stream	Tukituki
Dutch Creek	Tukituki (Makaororo)
Mangatutunui Stream	Mohaka
Donald River	Tutaekuri
Mangatahi Stream	Ngaruroro
Wairoa River	Wairoa
Waitio Stream	Tutaekiri
Esk River	Esk
Makahu River	Mohaka
Mangaone River	Tutaekuri
Tukipo River	Tukituki
Cochranes Creek	Tukituki (Waipawa)
Maraetotara River	Maraetotara
Okoeke Stream	Mohaka (Waipunga)
Deep Stream	Esk
Okurakura Stream	Esk
Ohara Stream	Ngaruroro
Maharakeke Stream	Tukituki
Mangamauku Stream	Tukituki
Mangaaruhe River	Wairoa
Waikaretaheke River	Wairoa
Matahorua Stream	Waikari
Aropaoanui River	Aropaoanui
Koau Stream	Ngaruroro
Nuhaka River	Nuhaka
Mangamate Stream	Wairoa
Makaretu Stream	Wairoa
Taharua River	Mohaka
Otakarara Stream	Tutaekuri
Mangataura Stream	Tukituki
Karamu Stream	Ngaruroro
Maraekakaho River	Ngaruroro
Poporangi Stream	Ngaruroro
Te Ngaru Stream	Te Ngaru Stream
Kikowhero Stream	Ngaruroro
Ohiti Stream	Ngaruroro
Ohiwia Stream	Ngaruroro
Okawa Stream	Ngaruroro
Omahaki Stream	Ngaruroro
Big Hill Stream	Ngaruroro (Poporangi)
Ongaonga Stream	Tukituki
Mangarara Stream	Tukituki
Omakare Stream	Tukituki
Papanui Stream	Tukituki
Mangatarata Stream	Tukituki

APPENDIX 4b: Significance assessment calculations for salmonid angling (Steps 1 and 5-8)

Step 1: Define river segments		Step 6A: Apply indicators and thresholds										Step 6B: Apply indicators and thresholds										Assigning significance					
River	Tributary of:	Angler days (n) (NAS 2007/8,2001/2,1994/6)	Intensity of use (mean free reach) (NAS 2007/8)	Travel distance (km) (Median NAS 2007/08)	Overseas anglers (%) (NAS 2007/8)	Perception catch rate (1-5)	Perception fish size (1-5)	Water quality (0.0-1.0)	Perception of scenic attractiveness (1-5)	Perception of wilderness (1-5)	Perception importance (1-5) (NAS 1979/80)	Angler days score	Intensity of use score	Travel distance score	Overseas score	Perception catch rate score	Perception fish size score	Water quality score	Perception scenic score	Perception wilderness score	Perception importance score	Initial River Ranking(step 7)	River Ranking (step 8)	Sum Weights 1	Rank 1	Sum Weights 2	Rank 2 (FINAL RANKING)
Mohaka River (source to sea)	Mohaka	7046	7	80	14	7046	3.31	0.70	4.22	4.39	4.05	**3**	**2**	**2**	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**26**	High	**29**	High	**27**	**High**
Mohaka River (upstream of Mang. Confluence)	Mohaka	2196	***2***	***100***	***30***	2196	***3.80***	***0.80***	***4.80***	***4.80***	***4.50***	**2**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**27**	High	**29**	High	**27**	**High**
Ruakituri River	Wairoa	1995	8	84	16	1995	3.77	0.60	4.73	4.63	4.55	**2**	**2**	**2**	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**25**	High	**27**	High	**25**	**High**
Tukituki River (source to sea)	Tukituki	14000	2	26	11	14000	2.68	0.7	3.13	3.28	3.91	**3**	**3**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**22**	Med	**25**	High	**24**	**High**
Ngaruroro River above Taruarau conf.	Ngaruroro	765	8	60	***25***	765	***4.50***	*0.90*	***4.50***	***4.50***	***4.50***	**1**	**2**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**25**	High	**26**	High	**24**	**High**
Hopuruahine	Wairoa	64	11	211	0	64	3.50	***0.90***	4.67	4.33	4.43	**1**	**2**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**25**	High	**26**	High	**23**	**High**

Stream	(Waikaremoana)																											
Ripia River	Mohaka	118	31	80	***50***	118	3.10	0.90	4.32	4.50	3.95	**1**	**1**	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**24**	High	**25**	High	**23**	**High**
Tukituki River - Waipawa confluence to Patangata Bridge	Tukituki	6000	1	30	11	6000	***2.6***	*0.7*	***2.8***	***3***	***3.9***	**3**	**3**	**1**	**2**	**3**	**2**	**2**	**1**	**1**	**3**	**21**	Med	**24**	High	**23**	**High**
Te Hoe River	Mohaka	49	238	303	64	49	2.83	***0.80***	4.71	4.71	4.14	**1**	**1**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**24**	High	**25**	High	**22**	**High**
Mohaka River (Mang. Confluence to SH5)	Mohaka	2292	***5***	***80***	***10***	2292	***3.20***	***0.80***	***3.50***	***3.40***	***4.14***	**2**	**2**	**2**	**2**	**3**	**2**	**2**	**2**	**2**	**3**	**22**	Med	**24**	High	**22**	**High**
Waipawa River	Tukituki	1315	13	24	10	1315	2.74	0.8	3.17	3.42	3.92	**2**	**2**	**1**	**2**	**3**	**2**	**2**	**2**	**2**	**3**	**21**	Med	**23**	High	**22**	**High**
Mohaka River (SH5 to sea)	Mohaka	2704	***13***	***100***	***10***	2704	***3.20***	***0.70***	***3.50***	***4.20***	***3.80***	**2**	**2**	**2**	**2**	**3**	**2**	**2**	**2**	**2**	**2**	**21**	Low	**23**	High	**21**	**Med**
Tukituki River above Waipawa confluence	Tukituki	3000	4	65	11	3000	***2.6***	*0.7*	***3.6***	***3.8***	***3***	**2**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**21**	Low	**23**	High	**21**	**Med**
Ngaruroro River (source to sea)	Ngaruroro	4271	11	18	6	4271	2.94	0.8	3.53	3.85	3.87	**2**	**2**	**1**	**1**	**3**	**2**	**2**	**2**	**2**	**3**	**20**	Med	**22**	High	**21**	**Med**
Waiau River	Wairoa	293	81	109	27	293	3.00	0.60	4.36	4.07	3.42	**1**	**1**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2**	**22**	Med	**23**	High	**20**	**Med**
Waipunga River	Mohaka	246	59	113	39	246	2.85	0.80	4.02	4.00	3.72	**1**	**1**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2**	**22**	Med	**23**	High	**20**	**Med**
Mangatutu Stream	Tutaekuri	323	18	55	5	323	2.54	*0.5*	4.46	4.38	4.15	**1**	**2**	**2**	**1**	**2**	**2**	**2**	**3**	**3**	**3**	**21**	Med	**22**	High	**20**	**Med**
Tukituki River below Patangata Bridge	Tukituki	5000	3	15	11	5000	***2.6***	*0.7*	***2.8***	***3***	***3.7***	**2**	**3**	**1**	**2**	**3**	**2**	**2**	**1**	**1**	**2**	**19**	Med	**21**	Med	**20**	**Med**
Taruarau River	Ngaruroro	286	51	79	0	286	3.38	0.8	4	4.33	3.67	**1**	**1**	**2**	**1**	**3**	**3**	**2**	**2**	**3**	**2**	**20**	Med	**21**	Med	**19**	**Med**
Tutaekuri River	Tutaekuri	6214	4	13	2	6214	2.39	0.80	2.83	2.90	3.28	**3**	**3**	**1**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**17**	Med	**20**	Medium	**19**	**Med**

Mokau Stream	Wairoa (Waikaremoana)	21	17	65	***10***	21	***2.60***	***0.80***	***4.1***	***3.5***	***3***	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**2**	**2**	**20**	Low	**21**	Med	**19**	**Med**
Mangaonuku Stream	Tukituki	317	13	33	***11***	317	2.4	0.6	3.35	3.53	3.56	**1**	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**18**	Low	**19**	Med	**18**	**Med**
Esk River	Esk	1005	9	28	0	1005	2.64	0.70	3.49	3.68	3.23	**2**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**17**	Low	**19**	Med	**18**	**Med**
Ngaruroro River below Taruarau conf.	Ngaruroro	3415	49	25	***5***	3415	***3.00***	*0.70*	***3.00***	***2.50***	***3.20***	**2**	**1**	**1**	**1**	**3**	**2**	**2**	**2**	**1**	**2**	**17**	Low	**19**	Med	**18**	**Med**
Hangaroa River	Wairoa	623	46	75	3	623	3.20	0.50	3.83	3.83	3.58	**1**	**1**	**2**	**1**	**3**	**2**	**2**	**2**	**2**	**2**	**18**	Low	**19**	Med	**17**	**Med**
Mangapoike River	Wairoa	14	809	52	0	14	3.00	*0.60*	3.50	4.00	3.00	**1**	**1**	**2**	**1**	**3**	**2**	**2**	**2**	**2**	**2**	**18**	Low	**19**	Med	**17**	**Med**
Waiotukupuna Stream	Wairoa (Waikaremoana)	***20***	***61***	65	0	***20***	***2.60***	***0.90***	***4.1***	***3.5***	***2.80***	**1**	**1**	**2**	**1**	**2**	**2**	**3**	**3**	**2**	**1**	**18**	Med	**19**	Med	**17**	**Med**
Aniwaniwa Stream	Wairoa (Waikaremoana)	121	3	197	0	121	2.00	0.90	3.60	3.30	2.50	**1**	**3**	**3**	**1**	**1**	**1**	**3**	**2**	**2**	**1**	**18**	Med	**19**	Med	**16**	**Med**
Waikari River	Waikari	132	33	108	10	132	2.78	0.60	3.60	3.91	2.55	**1**	**1**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**18**	Low	**19**	Med	**16**	**Med**
Makaroro River	Tukituki (Waipawa)	26	312	50	***5***	26	2.4	0.8	4.09	4.08	2.83	**1**	**1**	**2**	**1**	**2**	**2**	**2**	**3**	**2**	**1**	**17**	Low	**18**	Med	**16**	**Med**
Mangaone River	Tutaekuri	314	21	25	0	314	2.45	0.8	3.61	3.86	3.36	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**16**	Low	**17**	Med	**16**	**Med**
Tukipo River	Tukituki	414	10	42	0	414	2.53	0.8	3.25	3.06	3.39	**1**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**1**	**2**	**16**	Low	**17**	Med	**16**	**Med**
Maraetotara River	Maraetotara	316	15	26	0	316	2.89	0.8	3.48	3.52	3.75	**1**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**16**	Low	**17**	Med	**16**	**Med**
Kopuawhara Stream	Kopuawhara	82	54	129	0	82	2.00	0.50	3.00	3.50	3.50	**1**	**1**	**3**	**1**	**2**	**1**	**2**	**2**	**2**	**2**	**17**	Low	**18**	Med	**15**	**Low**
Inangatahi River	Mohaka	91	28	414	78	91	3.17	***0.60***	2.50	2.50	2.67	**1**	**1**	**3**	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**17**	Med	**18**	Med	**15**	**Low**
Makaretu River	Tukituki	56	58	524	0	56	2.5	0.8	3.75	3.5	3	**1**	**1**	**3**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**17**	Low	**18**	Med	**15**	**Low**
Waikoau River	Aropaoanui	146	30	53	0	146	2.14	***0.60***	4.13	4.44	2.56	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**3**	**3**	**1**	**16**	Med	**17**	Med	**15**	**Low**
Ohara Stream	Ngaruroro	192	28	49	0	192	2.39	*0.7*	3.57	3.76	3.14	**1**	**1**	**1**	**1**	**2**	**1**	**2**	**2**	**2**	**2**	**15**	Low	**16**	Med	**15**	**Low**
Cochranes Creek	Tukituki (Waipawa)	***100***	***7***	50	***20***	***100***	***2.6***	*0.6*	***2.3***	***3.0***	***2.7***	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**16**	Low	**17**	Med	**15**	**Low**

Maharakeke Stream	Tukituki	20	179	65	***10***	20	2.9	0.5	2.78	2.89	3.1	**1**	**1**	**2**	**2**	**1**	**2**	**2**	**1**	**1**	**2**	**15**	Low	**16**	Med	**14**	**Low**
Waikaretahe ke River	Wairoa	37	276	54	0	37	***2.60***	0.70	***2.50***	***2.50***	***2.50***	**1**	**1**	**2**	**1**	**2**	**2**	**2**	**1**	**1**	**1**	**14**	Low	**15**	Low	**13**	**Low**
Aropaoanui River	Aropaoanui	27	137	53	0	27	2.33	0.60	3.40	3.80	2.67	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**1**	**14**	Low	**15**	Low	**13**	**Low**
Nuhaka River	Nuhaka	***80***	***30***	30	0	***80***	***2***	0.50	***3.6***	***3.8***	***2.50***	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**1**	**13**	Low	**14**	Low	**13**	**Low**
Makaretu Stream	Wairoa	***20***	***122***	40	***5***	***20***	***2.00***	*0.60*	***3.60***	***3.91***	***2.20***	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**1**	**13**	Low	**14**	Low	**13**	**Low**
Taharua River	Mohaka	***10***	***195***	100	0	***10***	2.20	0.70	2.70	3.30	2.50	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**13**	Low	**14**	Low	**12**	**Low**
Wairoa River	Wairoa	27	339	463	***0***	27	1.50	*0.50*	1.80	1.50	1.00	**1**	**1**	**3**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**13**	Low	**14**	Low	**11**	**Low**
Te Ngaru Stream	Te Ngaru Stream	***10***	***97***	20	0	***10***	***2***	*0.60*	***2.00***	***2.00***	***2.00***	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**11**	Low	**12**	Low	**11**	**Low**
Taharua River (NAS Data 1979 - 1 record)	Mohaka	***10***	***195***	100	***0***	***10***	3.40	0.70	4.33	4.33	4.67	**1**	**1**	**2**	**1**	**3**	**3**	**2**	**3**	**3**	**3**						
Wairoa River (NAS data - 7 responses)	Wairoa	27	339	463	217	27	3.00	*0.50*	3.57	3.57	3.57	**1**	**1**	**3**	**3**	**1**	**2**	**2**	**2**	**2**	**2**						
Aniwaniwa Stream	Wairoa (Waikaremoana)	121	3	197	0	121	2.00	0.90	5.00	5.00	3.00	**1**	**3**	**3**	**1**	**1**	**1**	**3**	**3**	**3**	**2**						
Inangatahi River	Mohaka	91	28	414	347	3.00	3.17	***0.60***	3.67	3.83	2.67	**1**	**1**	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**1**						

Colour Code Key (as at 23 April 2012)

Significance thresholds (highlighted columns)

Green	High = National
Blue	Medium = Regional

Yellow	Low = Local

Misc (highlighted rivers)

Pink	Rivers overlap with neighbouring council

Data reliability (font colour)

Green	Reliable data
Blue/Purple	Less reliable data
Red	Data checked by Expert Panel and has been adjusted

Blue rows - limited NAS data (<15 respondents)

Purple row - limited perceptions data (<7 respondents)

APPENDIX 4c. Water quality calculations

Site ID		Average Ecoli Oct-Apr	Average Summer Temp	Alert Ecoli score	Action Ecoli score	Temperature Score	MCI score	DO score	Clarity score	WQ Score
3	Mohaka River at Raupunga	20	18.27	1	1	1	0.5	1	0.1	**0.7**
9	Esk @ Waipunga	73	17.43	1	1	1	0.5	1	0.1	**0.7**
12	Maraetotara @ Te Awanga	53	19.61	1	1	0.5	0.1	1	0.5	**0.6**
19	Makaretu @ SH50	100	16.29	1	1	1	0.5	1	0.5	**0.8**
144	Tukipo @ SH50	155	16.28	1	1	1	0.5	1	0.5	**0.8**
253	Maraetotara @ Waimarama Rd	24	17.21	1	1	1	0.5	1	0.5	**0.8**
266	Mangaone @ Rissington	15	18.43	1	1	1	0.5	1	0.5	**0.8**
277	Tutaekuri river @ Lawrence hut	731	17.41	1	1	1	0.1	1	0.1	**0.6**
280	Waipawa river at SH 50	77	16.56	1	1	1	0.5	1	0.5	**0.8**
284	Mangaonuku stream u/s Waipawa river at Tikokino road	31	16.28	1	1	1	0.1	1	0.5	**0.7**
303	Esk river at Berry road	83	14.30	1	1	1	0.5	1	0.5	**0.8**
317	Aropaoanui river at Aropaoanui / sideless bridge	146	19.22	1	1	0.5	0.5	1	0.1	**0.6**
321	Mokomokonui river u/s Waipunga river confluence @ Tartraakina road	13	15.32	1	1	1	1	1	0.5	**0.9**
322	Waipunga river @ Pohokura road bridge Runanga	9	12.73	1	1	1	1	1	0.1	**0.8**
330	Kopuawhara stream at lower rail bridge @ gauge station	109	19.82	1	1	0.5	0.5	1	0.1	**0.6**
333	Aniwaniwa stream @ State Highway 38 @ gauge station	40	nd	1	1	nd	1	1	0.5	**0.9**
336	Ruakituri river @ sports ground @ gauge station	39	15.00	1	1	1	0.5	1	0.1	**0.7**

337	Hangaroa river @ Donneraille Park @ gauge station	41	20.15	1	1	0.5	0.1	1	0.1	**0.5**
594	Waikari River at Glenbrook road	132	20.67	1	1	0.5	0.5	1	0.1	**0.6**
595	Mohaka river at Willowflat	19	19.44	1	1	0.5	0.5	1	0.1	**0.6**
604	Ripia river u/s Mohaka River confluence	33	17.20	1	1	1	1	1	0.5	**0.9**
1319	Waikaretaheke river @ Terapataki bridge crossing	114	16.03	1	1	1	0.5	1	0.1	**0.7**
2403	Tukituki River @ Shag Rock gauge station	44	17.52	1	1	1	0.1	1	0.5	**0.7**
2446	Taharua River @ Wairango (nearest to SH5)	44	17.53	1	1	1	0.5	1	0.5	**0.8**
2593	Ngaruroro River u/s Hawke's Bay Dairies	36	11.39	1	1	1	0.5	1	0.5	**0.8**
2594	Ngaruroro River d/s Hawke's Bay Dairies	35	18.30	1	1	1	1	1	0.5	**0.9**
3151	Taharua River @ Red hut	23	19.32	1	1	0.5	0.5	1	0.1	**0.6**

APPENDIX 5: Other factors relevant to the assessment of significance for salmonid angling (Step 9)

Access
Given access is a prerequisite for angling activity, it is of fundamental importance. Access includes the legal right as well as the practical ability to exercise this right (cross the land). Consideration must be given to the influence that access provision has upon the pattern of existing use - lack of legal or practical access may limit or completely restrict use, even to otherwise suitable sites.
Context
An individual river may have values that relate to its contribution to the regional collective. These may have important benefits to the region but are difficult to quantify. This includes several parameters: **Degree of scarcity of the experience** Where few alternative (substitute) sites exist that will satisfy the recreation experience being sought (e.g. challenging and remote wilderness angling), then the degree of scarcity is high (and vice versa). This notion has parallels with the biodiversity rarity argument – protection of the rare and endangered species. So too, for recreation opportunities – protection of the recreation opportunities that are most scarce. **Contribution to a collective value** Individual sites may contribute to a set of values found within a region or nationally – the sum may be greater than the parts. If parts of the collective are compromised, this may act as a 'tipping point' to reduce or negate the value of the collective. A good example is the Buller River, which has a wide range of tributary rivers of differing sizes, settings, and hydrological and fishery characteristics. Many anglers visit this area to be able to fish lake-fed large rivers, small catchment-fed bush streams, remote tannin-stained bush catchments, large lakes of glacial origin and smaller lakes surrounded by bush. Hundreds of kilometres' length of different fishing water is available and some fishing opportunity is always available irrespective of season or weather. This argument mirrors biodiversity hot spots of endemism – hot spots for angling may occur that require protection. **Users' perceptions of the river's 'status'** While more nebulous, anglers may rate a river in, for example, the top three best fishing areas in New Zealand/internationally.
Potential future angling use
This is about the potential to undertake angling at that place in the future. The goal is to avoid precluding future recreational use. The Recreation Opportunity Spectrum is predicated on the notion of the recreation opportunity rather than recreational use. An opportunity is just that – the *potential* to undertake a recreational

activity - which may be currently taken up (or not). This factor is therefore about potential, but not yet realised, opportunities. There are a variety of reasons why recreation opportunities may not be realised. Recreation is subject to rapid developments in technology and changing social preferences. Changes in access similarly may alter use. As a result, dramatic changes in use patterns can occur and existing use patterns may be poor indicators of future use value. For example, individual angler inflatables now facilitate angler access to sections of rivers previously not fished; fish finders have increased the chance for a lake fisher of catching a fish. The best example of this phenomenon is the work by Egarr and Egarr (1981). Their assessment of the recreational potential of New Zealand rivers nearly three decades ago does not match the current use patterns owing to the sort of factors already outlined. For this reason, 'future proofing' for potential recreational value is required. Some decisions may inadvertently preclude future recreational options. The goal is to avoid this outcome.
Existence value
Existence value relates to knowing that a resource exists and that the present generation will pass it on to the next generation (in a healthy state suitable for angling).
Past use
This value is also non-quantifiable and is associated with important past uses of a river. With respect to salmonid angling, former 'world renowned' fisheries are relevant.

APPENDIX 6: Future data requirements for salmonid angling

Data need
Users' perception of scenic attractiveness
Users' perception of wilderness character
Users' evaluation of the overall importance of the river
Users' satisfaction with their visit to the river for angling
Enter Ministry of Works 1956 list of rivers (i.e. make into electronic list) and link to REC