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Angler usage of lake and river fisheries managed by Fish & Game New Zealand: results from the 2007/08 National Angling Survey

NIWA Client Report: CHC2009-046
April 2009

NIWA Project: FGC08503

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Martin Unwin

Prepared for

Fish & Game New Zealand

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National Institute of Water & Atmospheric Research Ltd
10 Kyle Street, Riccarton, Christchurch
P O Box 8602, Christchurch, New Zealand
Phone +64-3-348 8987, Fax +64-3-348 5548
www.niwa.co.nz

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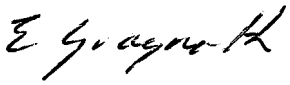

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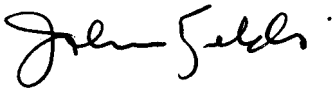

John Zeldis

Summary

This report summarises the 2007/08 National Angling Survey, conducted jointly by Fish & Game New Zealand (FGNZ) and NIWA from October 2007 to September 2008. The survey, the third of its type to be commissioned by FGNZ (following the first two such surveys in 1994/95 and 2001/02), provides estimates of total angling effort for all lake and river fisheries managed by FGNZ, but does not cover fisheries in the Taupo Conservancy (which are administered by the Department of Conservation). We describe the survey design and methodology, present and discuss the main results (via tables and figures in the body of the report, and an Appendix giving more detailed results for all fishing waters identified by the survey), comment on some of the limitations of the Survey, and make brief recommendations for future surveys.

The survey was a telephone sample survey, based on random samples drawn from records of fishing licence sales for the 2007/08 angling season. The survey was stratified by time (with the 12 month survey period divided into six two-monthly intervals), and by licence type (Stratum 1: adult whole-season and family licences; Stratum 2: young adult and junior whole season licences; Stratum 3: part-season licences). Sample sizes for each stratum were weighted in favour of whole-season licences, who were expected to contribute most of the total annual effort. In contrast to the previous two surveys, which was limited to New Zealand residents, overseas anglers were included in the 2007/08 survey using email as the method of contact.

Analysis of fishing licence sales showed substantial geographical variation in the popularity of freshwater angling throughout New Zealand. Per capita licence sales (based on the 2006 Census) appear to have increased slightly since the 2001/02 survey, but participation rates continue to be markedly higher in the rural south (up to one licence holder per six adult males) than in Auckland/Waikato (approximately one licence holder per 100 adult males). Overseas visitors accounted for 12.7% of total sales.

Total angling effort by for the 2007/08 season was estimated to be 1 271 300 ± 19 700 angler-days, of which 68 900 ± 2 800 angler-days (5.4%) were expended by overseas visitors. Total effort by New Zealand residents differed little from the corresponding figure for the previous two surveys, but there were significant changes at Regional and sub-Regional scales. The most marked long term changes occurred in the Auckland/Waikato, Eastern, and Nelson/Marlborough regions, all of which have experienced a steady decline since 1994/95, and in the West Coast and Central South Island regions (where effort has steadily increased since 1994/95). The North Canterbury region also experienced a large increase in effort since 2001/02, reflecting the strength of the 2007/08 salmon fishing season. Some South Island rivers in which the invasive aquatic diatom *Didymosphenia geminata* has become established have experienced a decline in effort since 2001/02, but effort on other affected rivers has either remained static or increased over the same period and there is little evidence of any general pattern.

A significant outcome of the 2007/08 survey has been the development of a robust linkage between the survey database and NIWA's River Environment Classification (REC). This process is currently over 95% complete, and – on completion – will allow angler usage data to be merged with the REC GIS database and analysed with respect to catchment and sub-catchment scale variables such as land use, stream gradient, and stream flow. Several examples to illustrate the potential of the REC to enhance the data visualisation tools available to FGNZ are presented.

Assuming FGNZ continues with the fourth survey in this series c. 2013, continuing advances in web technology are likely to allow further development of the basic methodology, and hence to minimise minor errors and ambiguities over details such as angler origin and individual river names, which currently remain unresolved. FGNZ is also encouraged to take advantage of opportunities for cross-validating the national survey during local and regional FGNZ surveys whenever it is feasible to do so.

1. Introduction

1.1. Freshwater angling in New Zealand

Freshwater angling, primarily for brown trout (*Salmo trutta*), rainbow trout (*Oncorhynchus mykiss*), and Chinook salmon (*O. tshawytscha*), is a popular leisure time activity for many New Zealanders and has a distinctive place in our national culture. Following successful acclimatisation to New Zealand waters over three decades from about 1875 (McDowall 1990, 1994), all three species rapidly became the basis of lively sports fisheries. Salmon are well established on the east coast of the South Island from Otago to north Canterbury, rainbow trout occur throughout the central North Island and South Island high country, and brown trout are widely distributed over the whole of the South Island, and the North Island south of Auckland (McDowall 1990). Smaller and more localised fisheries exist for other introduced salmonids (such as brook trout *Salvelinus fontinalis*), and "coarse fish" such as perch *Perca fluviatilis* and tench *Tinca tinca* (McDowall 1994).

In all fresh waters except Lake Taupo and its inflowing tributaries, angling for acclimatised species is managed by Fish & Game New Zealand (FGNZ). For administrative purposes New Zealand is divided into 12 FGNZ Regions[1], with six in each island (Figure. 1). The Lake Taupo fishery is managed by the Department of Conservation (DOC) (McDowall 1994). All persons wishing to fish for acclimatised species must purchase a freshwater fishing licence at least annually. Licences purchased from FGNZ are freely interchangeable between Regions, and are priced without regard to angler origin: overseas anglers pay the same as New Zealand residents, and residents of each Region pay the same as non-residents. It is possible, therefore, for anglers to live in one Region, purchase a licence from a second Region, and fish in a third. The DOC Taupo Conservancy is the sole exception: FGNZ licences are not valid within the Conservancy, and Conservancy licences are not valid elsewhere in New Zealand.

FGNZ management responsibilities create an ongoing need for timely and accurate data on angler use of the freshwater fisheries resource for a number of reasons. Under the 1990 Conservation Law Reform Act FGNZ is tasked with monitoring "… sports fish and game populations…" and the "… success rate and degree of satisfaction of users of the sports fish and game resource…", while also being required to "…maintain and improve the sports fish and game resource". Fulfilling this role effectively demands reliable information on angler usage. Up-to-date usage statistics

[1] Throughout this report words such as "Region" and "Regional", when capitalised, refer specifically to FGNZ Regions.

Figure 1: The twelve Fish & Game New Zealand Regions, and the Taupo Conservancy.

are also required by FGNZ when acting as an advocate for freshwater anglers in day to day situations (such as Regional Council or Planning Tribunal hearings) which arise through application of the Resource Management Act.

In 1994 FGNZ conducted a survey to estimate annual angling usage for all significant freshwater sports fisheries within the 12 FGNZ Regions (Unwin & Brown 1998). This survey was repeated in 2001 (Unwin & Image 2003), using essentially the same methodology as for the 1994 survey. By repeating these surveys at intervals of 6-7 years, FGNZ seeks to compile a long-term database so that up to date estimates of angling usage are always available, and to allow local, regional, and national trends in use to be monitored over decadal time scales.

This report describes the third of these surveys, conducted by the National Institute of Water and Atmospheric Research Ltd. (NIWA) on behalf of FGNZ during the 2007/2008 fishing season. It was initiated by FGNZ in October 2007, and was designed to provide comparable usage estimates for the 2007/2008 fishing season. This report presents results from the 2007/08 National Angling Survey, including estimated angling usage for all significant freshwater sports fisheries within the 12 FGNZ Regions.

2. Survey design and implementation

2.1. Scope, format, and objectives

The primary objective of the 2007/08 survey was to obtain consistent estimates of annual angler usage for all New Zealand lake and river fisheries managed by FGNZ. The rationale for adopting this narrow focus was articulated in the 1994/96 report (Unwin & Brown 1998) as follows: "…*angler usage is one of the most fundamental parameters needed to characterise a particular fishery, as well as being relatively easy to define and measure. We were also motivated by a desire … to do one job well, rather than attempt to pursue a range of additional objectives which would risk introducing design compromises. … the survey made no attempt to collect any information related to catch rate or size of fish*".

Subsequent events have reinforced this viewpoint. The 1994/96 and 2001/02 surveys are now well-established as a consistent and credible source of usage data for over 700 lakes and rivers throughout New Zealand. In addition, the surveys achieved their secondary aim of creating a database on angling usage of all fisheries managed by FGNZ. Further development of this database was therefore an important secondary objective of the present survey.

The survey was a telephone sample survey, based on random samples of anglers drawn from records of fishing licence sales for the 2007/08 angling season (1 October 2007 to 30 September 2008), stratified by Region, date of issue, and licence type. Licence records are an ideal basis for surveys of angling on waters managed by FGNZ because they provide an exhaustive listing of all individuals who are legally entitled to fish, and are readily amenable to selection of random sub-samples of any specified size. Licences sales for nine of the twelve Regions are managed by Eyede Ltd.[2], who provide real-time access to a centralised online database from which the most current records can be downloaded as required. Sales for the remaining three Regions (Northland, Taranaki, Southland) are maintained locally, but are also available electronically as required. Information requested for each licence holder includes name, address, contact details (phone and email), licence type, and date of issue.

An inherent limitation of the previous two surveys was our inability to sample licence holders who were overseas visitors, because of the paucity of viable telephone contact numbers and the logistical difficulties associated with overseas phone calls. Consequently, usage estimates for 1994/96 and 2001/02 were restricted to New Zealand resident anglers, and were conservative. For the 2007/08 survey we made a determined effort to address this bias by including overseas visitors as a separate stratum, using email as the method of contact. In the absence of any previous experience with an email survey of this type, and with significant constraints on our budget, we opted for an extremely simple email methodology (see section 2.2.3), which was at least partly experimental. Evaluating this methodology and assessing the utility of the results was thus an important secondary objective of the survey.

Our final objective was to build on preliminary work undertaken during the 2001/02 survey to link angler usage data derived from FGNZ's surveys with NIWA's River Environment Classification (REC) (Snelder & Biggs 2002). The main barrier to achieving this is that in the REC, river networks are represented as a tree-like network of discrete segments rather than as extended linear objects. This provides powerful tools for characterising rivers at catchment and sub-catchment scales, based on the individual characteristics of each segment (e.g., altitude, gradient, land use, rainfall), but provides no natural counterpart to the way anglers perceive a given river. To an angler, the Mataura River is a well defined body of water, following a clearly recognisable course from its headwaters in the Eyre Mountains to Gore, Mataura, and thence into Foveaux Strait. By contrast, the REC understands the Mataura catchment in great detail, but is unable *a priori* to consistently differentiate between the Mataura mainstem and its tributaries. Resolving this problem was our third objective.

The objectives of the 2007/08 survey were thus as follows:

[2] https://esoms.eyede.com/index.php

- to obtain consistent estimates of annual usage during the 2007/08 fishing season, by New Zealand resident anglers, for all lake and river fisheries managed by FGNZ;

- to develop and implement a simple email survey to collect corresponding usage data for overseas anglers visiting New Zealand, and to assess the utility of the resulting data;

- to develop a robust method for linking angling usage data to the REC.

2.2. Sampling design

The 2007/2008 survey was similar to the 2001/02 survey in general format, with only minor alterations to the methodology. A brief summary of the methodology is given in the following paragraph; readers seeking more detail are referred to the 2001/02 report (Unwin & Image 2003). The remainder of this section focuses on those aspects of the methodology which differ from the 2001/02 survey, including the overseas visitor email survey.

2.2.1. Licence types and strata

The survey was stratified by Region, date, and licence type, with the sampling frame for each stratum determined by partitioning licence sales on the basis of the issuing authority and date of issue. Most anglers purchasing their licence from Eyede choose one of the twelve FGNZ Regions with which they wish to affiliate, but a small proportion (0.6%) do not do so and were therefore treated as a separate New Zealand wide Region. We also created a fourteenth Region for overseas licence holders, on the assumption that the address specified on their licence receipt accurately reflected their country of origin. Licences for which this information was unavailable were not included in the sampling frame. We used date of issue to partition sales into two month intervals, beginning with October/November 2007, to create six temporal strata spanning the 2007/08 fishing season. We created three strata for licence type: one for adult and family whole season licences (Stratum 1); one for junior whole season licences (Stratum 2); and one for part-season licences (Stratum 3; see Unwin & Image 2003 for further details). Child licences, which are issued free to children under 12, were not surveyed. Licences were also cross-referenced to the gazetteer of New Zealand place names provided by Land Information New Zealand (LINZ) via their web site (www.linz.govt.nz) to allow us to differentiate between the Region in which each licence holder lived, and the Region from which they brought their licence. Overseas visitors were assigned to their country of residence if this information was recorded. Addresses which could not be identified were recorded as “unknown New

Zealand" if they appeared to be a New Zealand resident, and as "unknown" in all other cases. We used data from the 2006 Census, compiled via the Table Builder page on the Statistics New Zealand web site (http://www.stats.govt.nz/products-and-services/table-builder/2006-census-tables/default.htm), to estimate licence sales per head of population for each FGNZ Region (on the assumption that 90% of anglers are male; c.f.Unwin & Image 2003), and hence to analyse regional trends in the popularity of freshwater angling.

The ability for anglers holding any FGNZ licence to fish in any of the twelve FGNZ Regions, irrespective of where they live, has the potential to create confusion over what is meant by the word "Region" when presenting and cross-tabulating results. For any fishing event (i.e., any angler fishing any water at any time) up to three FGNZ Regions may be involved: the Region in which the angler lives (Region of residence); the Region from which they purchased their licence (licence Region), and the Region in which they fished (fishing Region). To avoid any ambiguity, we use the bracketed terms throughout the remainder of this report in any context where the word "Region", on its own, would be unclear.

2.2.2. Survey population

The survey population totalled 97 215 licence holders, representing 99.2% of licences sold in 2007/08 (Table 1). Of these, 84 875 (87.3%) were New Zealand residents, and 12 340 (12.7%) were from overseas residents. Country of residence could not be identified for 779 licences (0.8% of total sales), the majority of which (70%) were part-season. The proportion of overseas visitors varied markedly between Regions and strata, ranging from 2.7% to 17.9% for whole-season (Stratum 1) licence holders who affiliated with a particular Region, and from 0% to 43.7% for part-season (Stratum 3) licence holders. Very few junior whole-season licences (106 out of 4 857) were sold to overseas visitors.

Sampling frames for all strata were limited to the subset of licence holders who were provided contact details either as a telephone number (New Zealand residents), or an email address (overseas visitors). For New Zealand residents, the proportion of licences with at least one non-null (but not necessarily valid) telephone number averaged 93.9% (range 90.3% - 100%) for Stratum 1, 91.7% (range 85.9% - 100%) for Stratum 2, and 81.6% (range 70.0% - 100%) for Stratum 3. For overseas visitors, the corresponding proportions were 40.2% for Stratum 1, and 22.5% for Stratum 3. For all strata, we assumed that an individual's fishing activity was not related to whether or not they were contactable by phone or email, and hence that the sampling frame was unbiased with respect to usage estimates. This assumption is likely to be

Table 1: **Fishing licence sales for the 2007/2008 angling season by licence Region, licence stratum, and angler origin. Licences for which angler origin could not be determined (Stratum 1: 214; Stratum 2: 16; Stratum 3: 549) are not included.**

		Number of licences			
	FGNZ Region	Total	New Zealand resident	Overseas visitor	% overseas
Stratum 1	Northland	232	196	36	15.5%
(adult and family whole season)	Auckland/Waikato	3 987	3 800	187	4.7%
	Eastern	10 411	9 474	937	9.0%
	Taranaki	822	800	22	2.7%
	Hawkes Bay	2 432	2 261	171	7.0%
	Wellington	3 312	3 202	110	3.3%
	Nelson/Marlborough	2 971	2 438	533	17.9%
	West Coast	1 921	1 657	264	13.7%
	North Canterbury	11 607	10 650	957	8.2%
	Central South Island	8 794	8 105	689	7.8%
	Otago	11 731	10 978	753	6.4%
	Southland	6 426	5 828	598	9.3%
	New Zealand	379	236	143	37.7%
	Total, Stratum 1	**65 025**	**59 625**	**5 400**	**8.3%**
Stratum 2	Northland	22	22	0	0.0%
(junior whole season)	Auckland/Waikato	255	255	0	0.0%
	Eastern	657	631	26	4.0%
	Taranaki	107	107	0	0.0%
	Hawkes Bay	202	199	3	1.5%
	Wellington	303	301	2	0.7%
	Nelson/Marlborough	197	189	8	4.1%
	West Coast	170	165	5	2.9%
	North Canterbury	609	601	8	1.3%
	Central South Island	796	781	15	1.9%
	Otago	847	819	28	3.3%
	Southland	677	668	9	1.3%
	New Zealand	15	13	2	13.3%
	Total, Stratum 2	**4 857**	**4 751**	**106**	**2.2%**
Stratum 3	Northland	12	12	0	0.0%
(part season)	Auckland/Waikato	1 508	1 386	122	8.1%
	Eastern	9 396	7 223	2 173	23.1%
	Taranaki	311	270	41	13.2%
	Hawkes Bay	937	802	135	14.4%
	Wellington	773	667	106	13.7%
	Nelson/Marlborough	1 030	634	396	38.4%
	West Coast	822	541	281	34.2%
	North Canterbury	2 536	2 177	359	14.2%
	Central South Island	3 045	2 448	597	19.6%
	Otago	5 766	3 247	2 519	43.7%
	Southland	1 041	959	82	7.9%
	New Zealand	156	133	23	14.7%
	Total, Stratum 3	**27 333**	**20 499**	**6 834**	**25.0%**
	Total, all strata	**97 215**	**84 875**	**12 340**	**12.7%**

robust for New Zealand residents but could potentially be suspect for non-residents, particularly when the effect of invalid email addresses is taken into account (see Section 3.3).

2.2.3. Sample sizes

Target sample sizes for each stratum were chosen on the same basis as in 2001/02, and represented a trade-off between the desire to maximise the precision of the resulting usage estimates for a given level of sampling effort, and the need to capture data on as many fisheries as possible so as to maximise the volume of data available to Regional FGNZ managers. The first consideration tends to prioritise strata which make the largest contribution to total effort and total sample variance, at the expense of smaller strata, whereas the second requires a more even distribution of sampling effort across all strata. In practice, we used Neyman allocation (Cochran 1977, see also Unwin & Image 2003) to guide our choice of sample sizes for each licence type and survey period, with the largest samples allocated to Stratum 1 during the peak activity period from December to March, but used a degree of judgement when allocating sampling effort to each Region. Sample sizes for Strata 1 and 2 were chosen a priori for each Region and survey period, but for sampling purposes we treated Stratum 3 as a single stratum, retrospectively assigning each interview to the appropriate Stratum based on the date(s) for which the licence was valid and the Region of issue. This strategy was based on the assumption that anglers purchasing a single 24 hour licence would have no difficulty remembering where they had fished even as much as a year after the event, and allowed us to manage telephone interviews for part-season licence holders as a single block at the end of the 2007/2008 season.

Total sample size for the survey summed across the resulting 224 strata was 17 739, with 14 576 (82.2%) in Stratum 1, 1 599 (9.0%) in Stratum 2, and 1 564 (8.8%) in Stratum 3 (Table 2). Total samples for each two month survey period ranged from 4 382 (December 2007 – January 2008) to 1 699 (August – September 2008), reflecting the distribution of effort throughout the angling season. Nominal sample sizes for each Stratum 1 survey typically ranged from 100 (for the smaller Regions) to 450 (for the largest Regions) and represented anywhere from 1.4% to 27.3% of valid licences, with an average sampling fraction of between 2.5% and 6.7% for each period. Sample sizes for Stratum 2 (Junior whole season licences) were generally set at between 20 and 50, unless the 2001/02 data clearly indicated that a larger sample was appropriate. Sampling fractions for this stratum typically ranged from 5% to 10%. Sample sizes and sampling fractions for Stratum 3 varied between Regions, reflecting random variation associated with the retrospective process used to construct the samples, but consistently represented about 7% of licence holders over the first ten months of the survey. Relatively few interviews were obtained for August –

Table 2: **Licence sales and sample sizes for the 2007/08 National Angling Survey by Stratum, Region, and time period. Total licences for each stratum are those which are valid for the corresponding two month period, i.e., the cumulative number issued up to and including the last day of each period (Strata 1 and 2), or (for Stratum 3) those issued for each two month period. The three entries in each cell are the total number of valid licences, sample size, and sampling fraction (sample size as a percentage of the total).**

FGNZ Region	Oct - Nov	Dec - Jan	Feb - Mar	Apr - May	Jun - Jul	Aug - Sep	Total sample
Stratum 1							
Northland[3]	130 / 20 / 15.4%	174 / 30 / 17.2%	186 / 30 / 16.1%	195 / 30 / 15.4%	196 / 30 / 15.3%	196 / 30 / 15.3%	170
Auckland/Waikato	2 256 / 230 / 10.2%	3 087 / 303 / 9.8%	3 354 / 246 / 7.3%	3 679 / 153 / 4.2%	3 775 / 153 / 4.1%	3 800 / 152 / 4.0%	1 237
Eastern	5 669 / 251 / 4.4%	7 830 / 453 / 5.8%	8 421 / 449 / 5.3%	9 137 / 222 / 2.4%	9 401 / 262 / 2.8%	9 474 / 205 / 2.2%	1 842
Taranaki	550 / 150 / 27.3%	732 / 150 / 20.5%	765 / 149 / 19.5%	784 / 88 / 11.2%	796 / 60 / 7.5%	800 / 50 / 6.3%	647
Hawkes Bay	1 449 / 169 / 11.7%	1 978 / 201 / 10.2%	2 085 / 204 / 9.8%	2 202 / 99 / 4.5%	2 245 / 60 / 2.7%	2 261 / 100 / 4.4%	833
Wellington	1 998 / 163 / 8.1%	2 766 / 272 / 9.8%	2 972 / 253 / 8.5%	3 124 / 149 / 4.8%	3 186 / 103 / 3.2%	3 202 / 101 / 3.2%	1 041
Nelson/Marlborough	1 658 / 150 / 9.0%	2 154 / 191 / 8.9%	2 319 / 302 / 13.0%	2 411 / 152 / 6.3%	2 430 / 97 / 4.0%	2 438 / 100 / 4.1%	992
West Coast	874 / 151 / 17.3%	1 384 / 166 / 12.0%	1 575 / 262 / 16.6%	1 638 / 98 / 6.0%	1 652 / 100 / 6.1%	1 657 / 100 / 6.0%	877
North Canterbury	6 747 / 247 / 3.6%	9 630 / 450 / 4.7%	10 333 / 479 / 4.6%	10 573 / 274 / 2.6%	10 631 / 149 / 1.4%	10 650 / 152 / 1.4%	1 751
Central South Island	5 160 / 300 / 5.8%	7 528 / 477 / 6.3%	7 946 / 331 / 4.2%	8 060 / 210 / 2.6%	8 083 / 150 / 1.9%	8 105 / 148 / 1.8%	1 616
Otago	6 885 / 189 / 2.7%	10 077 / 395 / 3.9%	10 523 / 351 / 3.3%	10 814 / 197 / 1.8%	10 916 / 151 / 1.4%	10 978 / 150 / 1.4%	1 433
Southland	4 221 / 313 / 7.4%	5 566 / 439 / 7.9%	5 764 / 401 / 6.9%	5 816 / 193 / 3.3%	5 827 / 150 / 2.6%	5 828 / 155 / 2.7%	1 651
New Zealand	130 / 30 / 23.1%	192 / 40 / 20.8%	212 / 50 / 23.6%	227 / 20 / 8.8%	234 / 20 / 8.5%	236 / 20 / 8.5%	180
Overseas[4]	————	4 637 / 171 / 3.7%	————	————	5 400 / 134 / 2.5%	————	
Total, Stratum 1	37 727 / 2 363 / 6.2%	53 098 / 3 567 / 6.7%	56 455 / 3 507 / 6.2%	58 660 / 1 885 / 3.2%	59 372 / 1 485 / 2.5%	59 625 / 1 463 / 2.5%	14 576

[3] For the Northland Region, Strata 1 and 2 were pooled into a single Stratum, representing all whole season licences (i.e., adult, family, and junior).
[4] Overseas licence holders in Stratum 1 were surveyed at six monthly intervals, at the end of March 2008 and the end of September 2008.

FGNZ Region	Oct - Nov	Dec - Jan	Feb - Mar	Apr - May	Jun - Jul	Aug - Sep	Total sample
Stratum 2							
Auckland/Waikato	107 / 12 / 10.3%	183 / 14 / 7.7%	208 / 20 / 9.6%	237 / 20 / 8.4%	253 / 20 / 7.9%	255 / 20 / 7.8%	106
Eastern	263 / 17 / 6.5%	466 / 23 / 4.9%	518 / 48 / 9.3%	585 / 30 / 5.1%	623 / 30 / 4.8%	631 / 30 / 4.8%	178
Taranaki	54 / 30 / 55.6%	91 / 30 / 33.0%	100 / 22 / 22.0%	107 / 10 / 9.3%	107 / 10 / 9.3%	107 / 10 / 9.3%	112
Hawkes Bay	101 / 5 / 5.0%	165 / 12 / 7.3%	174 / 30 / 17.2%	193 / 20 / 10.4%	197 / 10 / 5.1%	199 / 20 / 10.1%	97
Wellington	123 / 14 / 11.4%	246 / 13 / 5.3%	266 / 25 / 9.4%	291 / 20 / 6.9%	301 / 20 / 6.6%	301 / 20 / 6.6%	112
Nelson/Marlborough	100 / 6 / 6.0%	161 / 4 / 2.5%	167 / 38 / 22.8%	181 / 10 / 5.5%	185 / 10 / 5.4%	189 / 20 / 10.6%	88
West Coast	70 / 7 / 10.0%	135 / 10 / 7.4%	157 / 20 / 12.7%	161 / 10 / 6.2%	165 / 10 / 6.1%	165 / 20 / 12.1%	77
North Canterbury	288 / 27 / 9.4%	516 / 46 / 8.9%	568 / 50 / 8.8%	597 / 20 / 3.4%	601 / 20 / 3.3%	601 / 20 / 3.3%	183
Central South Island	369 / 31 / 8.4%	724 / 48 / 6.6%	760 / 52 / 6.8%	778 / 30 / 3.9%	780 / 59 / 7.6%	781 / 20 / 2.6%	240
Otago	404 / 14 / 3.5%	746 / 39 / 5.2%	778 / 49 / 6.3%	804 / 20 / 2.5%	815 / 20 / 2.5%	819 / 20 / 2.4%	162
Southland	501 / 94 / 18.8%	645 / 50 / 7.8%	661 / 40 / 6.1%	668 / 20 / 3.0%	668 / 20 / 3.0%	668 / 20 / 3.0%	244
Total, Stratum 2[5]	2 380 / 257 / 10.8%	4 078 / 289 / 7.1%	4 357 / 394 / 9.0%	4 602 / 210 / 4.6%	4 695 / 229 / 4.9%	4 716 / 220 / 4.7%	1 599
Stratum 3							
Northland	2 / 1 / 50.0%	2 / 1 / 50.0%	4 / 4 / 100%	3 / 2 / 66.7%	1 / 1 / 100%	0 / 0 / 0.0%	9
Auckland/Waikato	313 / 26 / 8.3%	378 / 25 / 6.6%	307 / 25 / 8.1%	209 / 15 / 7.2%	106 / 7 / 6.6%	73 / 2 / 2.7%	100
Eastern	1 366 / 87 / 6.4%	2 224 / 141 / 6.3%	1 637 / 85 / 5.2%	958 / 48 / 5.0%	628 / 33 / 5.3%	410 / 5 / 1.2%	399
Taranaki	46 / 1 / 2.2%	111 / 12 / 10.8%	72 / 9 / 12.5%	29 / 6 / 20.7%	8 / 1 / 12.5%	4 / 0 / 0.0%	29
Hawkes Bay	153 / 7 / 4.6%	273 / 20 / 7.3%	159 / 8 / 5.0%	116 / 13 / 11.2%	43 / 2 / 4.7%	58 / 0 / 0.0%	50
Wellington	110 / 10 / 9.1%	263 / 22 / 8.4%	157 / 6 / 3.8%	81 / 10 / 12.3%	23 / 1 / 4.3%	33 / 1 / 3.0%	50
Nelson/Marlborough	139 / 8 / 5.8%	209 / 16 / 7.7%	194 / 24 / 12.4%	64 / 1 / 1.6%	16 / 0 / 0.0%	12 / 1 / 8.3%	50
West Coast	109 / 11 / 10.1%	153 / 18 / 11.8%	217 / 16 / 7.4%	42 / 4 / 9.5%	15 / 1 / 6.7%	5 / 0 / 0.0%	50
North Canterbury	391 / 40 / 10.2%	741 / 62 / 8.4%	762 / 90 / 11.8%	213 / 26 / 12.2%	40 / 5 / 12.5%	30 / 3 / 10.0%	226
Central South Island	429 / 32 / 7.5%	945 / 79 / 8.4%	719 / 58 / 8.1%	208 / 23 / 11.1%	59 / 6 / 10.2%	88 / 2 / 2.3%	200
Otago	488 / 34 / 7.0%	1 321 / 79 / 6.0%	832 / 64 / 7.7%	234 / 15 / 6.4%	119 / 9 / 7.6%	253 / 1 / 0.4%	202
Southland	190 / 20 / 10.5%	369 / 43 / 11.7%	239 / 20 / 8.4%	80 / 10 / 12.5%	58 / 6 / 10.3%	14 / 1 / 7.1%	100
New Zealand	14 / 2 / 14.3%	54 / 10 / 18.5%	32 / 3 / 9.4%	18 / 2 / 11.1%	11 / 3 / 27.3%	4 / 0 / 0.0%	20
Overseas	6 472 / 79 / 1.2%						
Total, Stratum 3	3 750 / 279 / 7.4%	7 043 / 528 / 7.5%	5 331 / 412 / 7.7%	2 255 / 175 / 7.8%	1 111 / 75 / 6.8%	913 / 16 / 1.8%	1 564
Total, all strata	43 857 / 2 899/ 6.6%	64 219 / 4 384 / 6.8%	66 143 / 4 313 / 6.5%	65 517 / 2 270 / 3.5%	65 178 / 1 789 / 2.7%	65 254 / 1 699 / 2.6%	17 739

[5] Junior whole season licence holders from the New Zealand Region and from overseas (total sales 13 and 87 licences, respectively) were not surveyed.

September 2008 because many of the corresponding licence records were not entered until after the sample was drawn in early October.

Telephone interviews for all New Zealand resident strata were conducted by the Southern Institute of Technology (SIT) in Invercargill. SIT call staff were provided with a random sub-sample of licence holders drawn from the sampling frame for each stratum, giving the licence number, name, and phone number for each individual in MS™ Excel format. Interviewers worked sequentially through each list, making one call to each licence holder and moving immediately to the next if there was no response. Respondents who indicated that they had fished during the relevant two month period were asked to specify which waters they had fished, and the number of days spent on each. Interviewers entered this data in real time, using a data entry form linked to a list of all recognised lake and river fisheries which provided a lookup to a standard index of numeric codes for each water. In addition, 25 large mainstem rivers which varied significantly in character over their length were divided into up to five sub-reaches (Table 3), with the data capture form issuing a prompt to remind the interviewer to ask respondents which reach they fished. This system proved to be very effective in practice, and greatly reduced the amount of cross-checking needed to resolve unknown or ambiguous river and lake names.

We surveyed overseas visitors using a simple email questionnaire which asked anglers essentially the same two questions as for the telephone interview samples, the only difference being the time period involved. We divided the angling year into two six month periods (October 2007 to March 2008, April to September 2008) for whole season licence holders (Stratum 1), and one twelve month period for part-season licence holders (Stratum 3). The questionnaire comprised a brief introductory paragraph emphasising the relevant survey period, followed by a request to list all waters fished and the number of days spent on each. We did not include a map or any master list of rivers, but invited respondents to email us back if they had difficulty remembering names. In the event very few respondents exercised this option, and the questionnaire format appeared to work well despite its simplicity.

2.3. Data analysis

To derive usage estimates for each stratum, we assumed that the respondents represented a simple random sample of all licence holders in that stratum. Essentially, this is equivalent to the assumption that those individuals who could not be contacted (by telephone or email, as appropriate) had the same fishing characteristics, on average, as those who were contacted. Responses for family licence holders were summed across all individuals fishing on that licence, to ensure that the licence (rather

Table 3: Mainstem rivers which were subdivided into two or more reaches for the 2007/08 survey.

River	Reach
Waikato	Huka Falls to Lake Ohakuri
	Below Karapiro
Whanganui	Above Ohura confluence
	Below Ohura confluence
Tarawera	Lake outlet to Tarawera Falls
	Below Tarawera Falls
Rangitaiki	Above Rabbit Bridge
	Aniwhenua Dam to Lake Matahina
	Below Matahina Dam
Mohaka	Above Mangatainoka confluence
	Mangatainoka to SH5 bridge
	Below SH5 bridge
Ngaruroro	Above Taruarau confluence
	Below Taruarau confluence
Tukituki	Above Waipawa confluence
	Waipawa confluence to Patangata
	Below Patangata
Manawatu	Above Dannevirke
	Dannevirke to SH2 (Woodville)
	SH2 (Woodville) to Palmerston North
	Palmerston North to Foxton
Rangitikei	Above Mangaohane Bridge
	Mangaohane Bridge to Vinegar Hill
	Vinegar Hill to Tangimoana
Ruamahanga	Above Mount Bruce (SH2)
	Mount Bruce (SH2) to Masterton
	Masterton to Martinborough (SH53)
	Martinborough to Lake Onoke
Buller	Rotoiti to Gowanbridge
	Gowanbridge to Lyell
	Below Lyell (West Coast Region)
Clarence	Above Acheron
	Below Acheron

River	Reach
Motueka	Above Wangapeka confluence
	Below Wangapeka confluence
Pelorus	Above Pelorus Bridge
	Below Pelorus Bridge
Takaka	Above Lindsay's Bridge
	Below Lindsay's Bridge
Wairau	Above Wash Bridge
	Below Wash Bridge
Arnold	Lake Brunner to dam
	Dam to Stillwater
Grey	Above Ikamatua
	Below Ikamatua
Hurunui	Above Mandamus
	Below Mandamus
Waitaki	Waitaki Dam to Kurow Bridge
	Kurow Bridge to Black Point
	Black Point to SH1
	SH1 to tidal limit
	Mouth and tidal zone
Clutha	Wanaka to Lake Dunstan
	Below Roxburgh
Taieri	Above Kokonga
	Kokonga to Outram Bridge
	Below Outram Bridge
Mataura	Above Gore
	Below Gore
Oreti	Above Lumsden
	Below Lumsden
Waiau	Te Anau to Manapouri
	Below Mararoa

than the individual) remained the basic sampling unit across all strata. For all angling waters fished by at least one respondent we then estimated the mean effort per respondent, and hence the estimated total effort for the whole stratum, as

$$E_{ij} = N_j \times \left(\sum_{k=1}^{nj} D_{ijk} \right) / n_j = N_j \times \bar{D}_{ij} / n_j$$

where

i	denotes the i^{th} angling water or reach thereof (i = 1 - 930);
j	denotes the j^{th} stratum (j = 1 - 224);
N_j	denotes the population size (i.e., number of active licences) in stratum j;
n_j	denotes the sample size for stratum j;
k	denotes the k^{th} respondent in a given stratum (k = 1, n_j);
D_{ijk}	denotes the number of days spent on angling water i by respondent k in stratum j; and
$\bar{D}_{ij}$	denotes the mean number of days per respondent spent on angling water i in stratum j,

with variance given by

$$s^2_{ij} = N_j \times \left(\sum_{k=1}^{nj} (D_{ijk} - \bar{D}_{ij})^2 \right) / (n_j - 1)$$

and standard deviation s_{ij}. Estimates of total annual effort E_i for angling water i, taking into account possible contributions from all 224 survey strata, were then obtained by summing E_{ij} over all j, and similarly for the estimated variance s^2_i. In addition, by restricting the sum to selected subsets of the full set of 224 strata, we were able to generate usage estimates for a specified survey period, licence stratum, licence Region, fishing Region, or any combination of these.

For summarising and reporting purposes, we merged these estimates with information on each angling water (such as catchment number and water type) to provide additional opportunities for cross-tabulation. Lake and river fisheries were classified separately, and were also broken down into one of eight generic sub-categories to allow for a finer level of tabulation (c.f. Unwin & Brown 1998). Lake fisheries were classified either as large natural lakes (those exceeding 5 km2 in surface area, according to Jolly & Brown 1974); small natural lakes (less than 5 km^2); and reservoirs (i.e., artificial impoundments of any type, such as hydro-electric, irrigation, or water supply dams). We classified river fisheries as mainstem fisheries (e.g. Manawatu, Motueka, Mataura); lowland fisheries (e.g. smaller coastal streams or mainstem tributaries wholly or partly flowing through areas of intensive land use, such

as the Waihou, Ashley, and Pomahaka); back country fisheries (upland tributaries characterised by extensive rather than intensive land use, e.g. the Maruia, Ahuriri, and Manuherikia); headwater fisheries (often remote rivers with limited access, such as the Karamea, Dingle, and Clinton); and artificial waters such as drains and hydro canals. While these distinctions (particularly between lowland, back country, and headwater fisheries) were often partly subjective, and did not allow for the fact that many rivers change in character over their length, they serve a useful purpose by helping to quantify the distribution of angling effort by fishery type and fishing Region.

3. Results

3.1. Licence database

The full 2007/08 FGNZ licence database contained 98 620 records, representing all licences issued (including child licences) for the 2007/08 fishing seasons. For survey analysis purposes we discarded all child licences (626 records); all licences for which the country of origin could not be determined (779 records); and all juniors who were either non-resident or not affiliated with any New Zealand licence Region (497 records). Of the 779 records of unknown origin 565 (73%) were either junior or part-season licences, the holders of which are unlikely to have contributed significantly to the total New Zealand angling effort during the 2007/08 fishing season. The final database used for estimation purposes thus totalled 96 734 licences, and represented 99.8% of the most active licence holders.

Analysis of licence sales by Region of residence showed similar geographic trends to those reported in 2001/02 (Table 4; c.f. Unwin & Image 2003), together with a marked increase in per capita sales of FGNZ licences over the intervening six years. We did not include licence sales for the Taupo Conservancy in our analyses for 2007/08, but even when allowance is made for these it is clear that per capita sales of whole season fishing licences remain markedly higher in the South Island than in the North Island, particularly in the more rural areas. Relative to 2001/02, per capita sales of FGNZ licences increased in all twelve FGNZ Regions over the intervening six years, both in absolute terms (109% - 152%), and per head of population (101% - 135%; Unwin & Image 2003).

3.2. Overseas visitors

Country of origin data were available for 12 163 overseas licence holders, representing a total of 90 nationalities from all seven continents (Table 5). If considered as a separate FGNZ Region, overseas licence holders would rank as the fourth largest, behind Eastern, Otago, and North Canterbury but ahead of Central

Table 4: **Sales of FGNZ whole-season fishing licences for the 2007/2008 angling season in relation to population figures from the 2006 Census, by FGNZ Region. The three columns for each age group (adult and junior) show the male population (N_{male}), the number of licences bought be residents of each region (N_{lic}), and the percentage of males holding a licence on the assumption that 90% of holders are male (% uptake). Note that these figures do not include licences sold by the Taupo Conservancy, and therefore underestimate participation rates in the North Island (c.f. Unwin & Image 2003).**

	Adult			Junior		
Region	**N_{male}**	**N_{lic}**	**% uptake**	**N_{male}**	**N_{lic}**	**% uptake**
Northland	51 900	269	0.5%	7 300	32	0.4%
Auckland/Waikato	583 000	6 327	1.0%	78 400	392	0.5%
Eastern	105 300	6 652	5.7%	14 600	430	2.6%
Taupo Conservancy (DoC)	11 700	421	3.2%	1 400	28	1.8%
Taranaki	53 200	853	1.4%	7 100	109	1.4%
Hawkes Bay	48 100	1 981	3.7%	6 600	156	2.1%
Wellington	219 700	4 039	1.7%	27 500	394	1.3%
Total, North Island	**1 073 100**	**20 542**	**1.9%**	**143 000**	**1 541**	**1.1%**
Nelson/Marlborough	49 600	2 275	4.1%	5 800	167	2.6%
West Coast	11 900	1 361	10.3%	1 400	136	8.9%
North Canterbury	158 700	11 685	6.6%	19 000	699	3.3%
Central South Island	37 100	7 159	17.4%	4 400	703	14.4%
Otago	66 100	9 982	13.6%	7 900	713	8.1%
Southland	33 200	5 961	16.2%	4 200	708	15.2%
Total, South Island	356 500	38 423	10.8%	42 700	3 126	7.3%
Total, New Zealand	1 429 600	58 965	4.1%	185 700	4 667	2.5%

Table 5: **FGNZ fishing licence sales to adult overseas anglers, 2007/08, by origin (region or continent) and licence type.**

	Licence type				
Angler origin	**Whole season**	**Part season**	**Total**	**% of total**	**% whole-season**
Oceania	2 317	2 538	4 855	39.7%	47.7%
North America	1 344	1 957	3 301	27.0%	40.7%
British Isles	690	1 019	1 709	14.0%	40.4%
Europe	754	685	1 439	11.8%	52.4%
SE Asia	206	482	688	5.6%	29.9%
Africa	56	69	125	1.0%	44.8%
Central/South America	4	42	46	0.4%	8.7%
Unknown	29	42	71	0.6%	40.8%
Total	5 400	6 834	12 163		44.1%

South Island in terms of total sales. The three most prominent countries of origin were Australia, USA, and the UK, which collectively accounted for over three quarters (77.5%) of overseas sales. Eight other countries accounted for a further 13.9% of the total: Japan, Germany, Canada, Sweden, France, Denmark, the Netherlands, and Switzerland. Overseas visitors (particularly those from Southeast Asia) tended to buy short-season licences, although visitors from Western Europe were more likely to invest in a whole-season licence.

3.3. The replies

Of the 17 739 respondents, 9 909 (55.9%) had fished during the survey period of interest. Taking family licences into account the fishing activities of 20 227 individuals were recorded, representing 12 654 anglers who purchased a single-person licence, and a further 7 573 anglers fishing on 5 091 family licences. Collectively, respondents fished for a total of 73 155 days, on 863 recognised lake and river fisheries, with a further 304 days (0.41% of the total) spent on waters which could not be identified by the interviewer. Data for respondents who fished within the Taupo Conservancy (2 652 days in total) were recorded as such during the interview, but were deleted from the data set used to estimate total usage.

The use of email to contact overseas visitors met with mixed success. All samples were affected by invalid email addresses which generated immediate bounces, and were discarded from the sample. The proportion of bounces was relatively low (16.5% and 19.1%) for whole-season and family licence holders surveyed in April 2008 and October 2008, respectively, but markedly higher (32%) for part-season licence holders. Response rates also differed widely between strata, ranging from 68% (172 of 253) for whole season licence holders surveyed after the first six months of the season (October 2007 to March 2008), to 47% (132 out of 278) for the same group surveyed after the final six months of the season (April to September 2008), and 29% (79 of 272) for part-season licence holders.

To provide some insight into the extent to which the responses actually received from overseas visitors were representative of the total population, we compared total licence sales by continent of origin with the corresponding number of respondents (Table 6). These results suggest that the responses were moderately biased in favour of licence holders from Oceania (primarily Australia), but were otherwise generally consistent with the pattern of sales. This does not necessarily imply that the respondents were unbiased with respect to their fishing habits, but gives us some confidence that any such biases are unlikely to have been large enough to dramatically skew the results.

Table 6: **Distribution of fishing licences held by overseas anglers by continent of origin (sorted in descending order of frequency), showing total sales for 2007/08; total records with a (not necessarily valid) email address; and the number of responses for each stratum.**

	Number of licences (whole-season)		Number of responses	
Angler origin	**All records**	**With email**	**Oct 2007 – Mar 2008**	**Apr – Sept 2008**
Oceania	2 317 (42.9%)	1 062 (48.9%)	105 (61.0%)	66 (50.0%)
North America	1 344 (24.9%)	522 (24.0%)	33 (19.2%)	38 (28.8%)
Europe	754 (14.0%)	254 (11.7%)	15 (8.7%)	10 (7.6%)
British Isles	690 (12.8%)	245 (11.3%)	13 (7.6%)	15 (11.4%)
Asia	206 (3.8%)	56 (2.6%)	4 (2.3%)	2 (1.5%)
Africa	56 (1.0%)	29 (1.3%)	2 (1.2%)	1 (0.8%)
Unknown	29 (0.5%)	2 (0.1%)	0 (0.0%)	0 (0.0%)
Latin America	4 (0.1%)	1 (0.0%)	0 (0.0%)	0 (0.0%)
Total	5 400	2 171	172	132

	Number of licences (part-season)		Number of responses
Angler origin	All records	With email	34 (43.0%)
Oceania	2 538 (37.1%)	523 (35.5%)	29 (36.7%)
North America	1 957 (28.6%)	486 (33.0%)	9 (11.4%)
British Isles	1 019 (14.9%)	237 (16.1%)	5 (6.3%)
Europe	685 (10.0%)	124 (8.4%)	2 (2.5%)
Asia	482 (7.1%)	70 (4.8%)	0 (0.0%)
Africa	69 (1.0%)	22 (1.5%)	0 (0.0%)
Unknown	42 (0.6%)	2 (0.1%)	0 (0.0%)
Latin America	42 (0.6%)	8 (0.5%)	79
Total	6 834	1 472	

3.4. Usage estimates

3.4.1. National and regional totals

Total estimated angling effort during the 2007/08 angling season was 1.27 ± 0.02 million angler days, with 727 400 angler-days (57.2% of the total) expended on river fisheries and 544 000 angler-days (42.8% of the total) expended on lake fisheries (Table 7). This effort was not distributed uniformly throughout New Zealand, with five fishing Regions (Eastern, North Canterbury, Central South Island, Otago, and

Southland) collectively accounting for 1.04 million days (82.2% of the total effort). Cross tabulation of the same data set by licence Region shows a similar geographic pattern but suggests that usage per licence holder varied relatively little among Regions, typically ranging from 15-20 angler-days per year for Stratum 1 (Table 8). Stratum 1 licence holders (adult whole season and family) accounted by far the largest proportion of the total angling effort (1 196 000 ± 19 500 angler-days; 94.0%; Table 8). Stratum 2 licence holders (junior and young adult whole season) contributed a further 45 400 ± 2 400 angler-days (3.6% of the total), with Stratum 3 (part-season) licence holders accounting for the remaining 2.3% (29 700 ± 1 050 angler-days). Overseas visitors accounted for an estimated 69 100 ± 2 800 angler-days, the great majority of which (59 500 angler-days) was associated with whole-season licence holders (Table 8).

Table 7: **Total angling effort (thousands of angler-days ± 1 standard error) by FGNZ Region (as defined by where the effort was recorded) and water type (river vs. lake) for the 2007/08 angling season. Figures in parentheses show the regional total for each water type as a percentage of the national total.**

Region	Rivers	Lakes	Total
Northland	1.9 ± 0.3 (0.3%)	1.7 ± 0.4 (0.3%)	3.7 ± 0.5 (0.3%)
Auckland/Waikato	20.9 ± 1.5 (2.9%)	9.8 ± 1.9 (1.8%)	30.7 ± 2.4 (2.4%)
Eastern	50.6 ± 5.0 (7.0%)	165 ± 6.9 (30.3%)	215.6 ± 8.6 (17.0%)
Taranaki	12.7 ± 1.0 (1.8%)	4.2 ± 1.0 (0.8%)	16.9 ± 1.4 (1.3%)
Hawkes Bay	33.5 ± 2.5 (4.6%)	2.6 ± 0.8 (0.5%)	36.1 ± 2.6 (2.8%)
Wellington	43.8 ± 2.5 (6.0%)	1.2 ± 0.4 (0.2%)	45.1 ± 2.6 (3.5%)
Nelson/Marlborough	35.8 ± 1.9 (4.9%)	5.2 ± 0.8 (1.0%)	41.1 ± 2.1 (3.2%)
West Coast	34.2 ± 1.9 (4.7%)	17.1 ± 1.5 (3.1%)	51.3 ± 2.4 (4.0%)
North Canterbury	167.7 ± 8.2 (23.1%)	32.3 ± 2.5 (5.9%)	200.1 ± 8.6 (15.7%)
Central South Island	123.8 ± 6.4 (16.9%)	128.4 ± 6.4 (23.6%)	252.2 ± 9.0 (19.8%)
Otago	88.2 ± 5.5 (12.1%)	136.7 ± 7.6 (25.1%)	224.9 ± 9.4 (17.7%)
Southland	114.1 ± 5.2 (15.7%)	39.6 ± 3.3 (7.3%)	153.7 ± 6.2 (12.1%)
Total	727.4 ± 14.6	544.0 ± 13.2	1271.4 ± 19.7

Table 8: **Total angling effort (thousands of angler-days), total licence sales, and mean effort per licence holder by FGNZ Region (as defined by angler origin) and licence type for the 2007/08 angling season.**

	Adult WS / Family			Junior WS			Part-season		
	Days x 1000	$N_{Licences}$	Days / licence	Days x 1000	$N_{Licences}$	Days / licence	Days x 1000	$N_{Licences}$	Days / licence
Northland	1.9	196	9.5		22		0.0	12	1.0
Auckland/Waikato	48.8	3 800	12.8	2.0	255	8.0	1.2	1 386	0.9
Eastern	179.0	9 474	18.9	5.5	631	8.7	7.1	7 223	1.0
Taranaki	13.5	800	16.9	1.4	107	13.2	0.2	270	0.9
Hawkes Bay	32.4	2 261	14.3	1.2	199	6.0	0.8	802	1.0
Wellington	48.1	3 202	15.0	2.7	301	9.0	0.6	667	0.9
Nelson/Marlborough	30.2	2 438	12.4	0.9	189	4.9	0.6	634	1.0
West Coast	30.8	1 657	18.6	1.2	165	7.5	0.5	541	1.0
North Canterbury	224.9	10 650	21.1	6.4	601	10.7	2.3	2 177	1.0
Central South Island	178.6	8 105	22.0	6.6	781	8.4	2.6	2 448	1.1
Otago	219.4	10 978	20.0	6.0	819	7.3	3.2	3 247	1.0
Southland	125.4	5 828	21.5	11.4	668	17.1	1.0	959	1.0
New Zealand	3.7	236	15.8		13		0.1	133	0.9
Overseas	59.5	5 400	11.0		106		9.6	6 834	1.4
Total	1196.3	65 025	18.4	45.4	4 857	9.4	29.7	27 333	1.1

Angling effort was strongly seasonal, with 81.0% of the annual total (973 900 ± 16 700 angler-days) expended over the six months from October to March, and a further 9.9% (118 900 ± 6 700 angler-days) in April/May (Table 9). This is largely a reflection of seasonal restrictions imposed by FGNZ, with angling on many non-lowland river fisheries and smaller lakes limited to a seven month season from 1 October to 30 April.

3.4.2. Cross-boundary fishing

New Zealand resident anglers affiliated with one of the twelve FGNZ Regions expended 78.1% of their effort within their home Region, with most of the remainder (16.4%) expended in a geographically adjacent Region (Table 10). Only 5.5% of the total (65 400 angler days) was expended by anglers travelling further afield, of which 47 400 angler days were recorded in the South Island and 18 000 in the North Island. The largest contributions to cross-boundary fishing occurred in the lower South Island, with substantial movement of anglers between North Canterbury and Central South Island, Central South Island and Otago, and Otago and Southland. In the North Island,

Table 9: **Total angling effort (thousands of angler-days ± 1 standard error) by FGNZ Region (as defined by where the effort was recorded) and survey period (successive two month intervals from October 2007) for New Zealand resident anglers fishing during the 2007/08 angling season. Overseas residents were surveyed at six or twelve month intervals rather than bimonthly, and are excluded from the table.**

Region	Oct - Nov	Dec - Jan	Feb - Mar	Apr - May	Jun - Jul	Aug - Sep	Total
Northland	0.6 ± 0.2 (15.3%)	1.0 ± 0.2 (28.6%)	0.9 ± 0.3 (23.5%)	0.2 ± 0.1 (6.4%)	0.9 ± 0.4 (25.1%)	0.0 ± 0.0 (1.0%)	3.7 ± 0.5
Auckland/Waikato	4.3 ± 0.5 (14.4%)	7.1 ± 0.9 (23.7%)	7.4 ± 1.0 (24.7%)	4.3 ± 1.6 (14.5%)	3.4 ± 0.9 (11.5%)	3.3 ± 0.7 (11.2%)	29.8 ± 2.4
Eastern	26.4 ± 2.2 (12.6%)	64.5 ± 3.9 (30.8%)	41.8 ± 2.7 (20.0%)	37.2 ± 3.8 (17.8%)	17.3 ± 2.5 (8.3%)	22.2 ± 4.9 (10.6%)	209.5 ± 8.5
Taranaki	3.8 ± 0.4 (23.3%)	4.7 ± 0.7 (28.8%)	3.2 ± 0.5 (19.4%)	1.8 ± 0.4 (10.8%)	0.9 ± 0.4 (5.3%)	2.0 ± 0.9 (12.3%)	16.4 ± 1.4
Hawkes Bay	5.8 ± 0.5 (17.9%)	8.2 ± 0.8 (25.4%)	8.0 ± 1.0 (24.5%)	3.5 ± 0.6 (10.9%)	2.8 ± 0.7 (8.6%)	4.1 ± 1.8 (12.7%)	32.5 ± 2.4
Wellington	7.8 ± 0.9 (17.6%)	11.1 ± 1.1 (25.1%)	12.6 ± 1.3 (28.3%)	7.3 ± 1.0 (16.4%)	4.1 ± 1.3 (9.3%)	1.5 ± 0.4 (3.4%)	44.4 ± 2.6
Nelson/Marlborough	8.9 ± 1.1 (25.8%)	12.4 ± 1.2 (36.0%)	8.7 ± 0.9 (25.2%)	2.6 ± 0.5 (7.5%)	1.2 ± 0.4 (3.4%)	0.7 ± 0.4 (2.1%)	34.4 ± 2.0
West Coast	7.4 ± 0.9 (17.2%)	14.3 ± 1.3 (33.2%)	12.7 ± 1.1 (29.6%)	3.1 ± 0.7 (7.3%)	2.2 ± 0.7 (5.2%)	3.2 ± 0.7 (7.4%)	43.1 ± 2.3
North Canterbury	32.8 ± 4.2 (16.8%)	71.9 ± 5.1 (36.8%)	71.3 ± 5.0 (36.5%)	12.7 ± 1.9 (6.5%)	2.3 ± 0.6 (1.2%)	4.5 ± 1.2 (2.3%)	195.4 ± 8.6
Central South Island	35.7 ± 2.7 (14.8%)	107.9 ± 6.0 (44.7%)	67.5 ± 4.9 (28.0%)	18.7 ± 2.8 (7.7%)	5.1 ± 1.9 (2.1%)	6.5 ± 1.4 (2.7%)	241.4 ± 9.0
Otago	45.0 ± 6.0 (20.9%)	99.7 ± 5.4 (46.3%)	42.8 ± 3.3 (19.9%)	15.0 ± 2.6 (7.0%)	3.1 ± 0.8 (1.4%)	9.8 ± 2.0 (4.6%)	215.4 ± 9.4
Southland	39.2 ± 3.2 (28.8%)	49.8 ± 3.4 (36.6%)	26.7 ± 2.0 (19.6%)	12.3 ± 2.6 (9.1%)	3.6 ± 0.8 (2.6%)	4.6 ± 1.7 (3.4%)	136.3 ± 5.9
Total	217.7 ± 8.9 (18.1%)	452.9 ± 11.2 (37.7%)	303.4 ± 8.7 (25.2%)	118.9 ± 6.7 (9.9%)	46.9 ± 3.9 (3.9%)	62.7 ± 6.3 (5.2%)	1 202.4 ± 19.5

Table 10: **Distribution of estimated angling effort (thousands of angler-days), 2007/08, by licence Region (row headings), and fishing Region (column headings). Diagonal entries (bold face) denote effort recorded by anglers fishing within their licence Region; off-diagonal entries represent cross-boundary fishing. Row totals give the effort (± 1 se) recorded by licence holders from each Region; thus, Northland licence holders fished for an estimated 1 880 angler-days. Column totals give the total effort (± 1 SE) recorded within each Region; thus, an estimated 4 030 angler-days were recorded within the Northland Region. See Section 3.4.2 for further details.**

	Region where angler fished												
Region where fishing licence was issued	**Northland**	**Auckland/ Waikato**	**Eastern**	**Taranaki**	**Hawkes Bay**	**Wellington**	**Nelson/ Marlborough**	**West Coast**	**North Canterbury**	**Central South Island**	**Otago**	**Southland**	**Total**
Northland	**1.08**	0.05	0.12	0.07	0.03	0.00	0.05	0.02	0.03	0.29	0.13	0.02	1.88 ± 0.30
Auckland/Waikato	0.97	**24.95**	18.38	1.72	1.29	0.51	0.17	0.39	1.08	0.72	1.44	0.42	52.04 ± 3.02
Eastern	0.75	2.50	**175.76**	1.73	3.99	1.37	1.04	0.77	0.85	1.57	1.05	0.22	191.6 ± 8.57
Taranaki	0.03	0.88	1.15	**11.69**	0.13	0.52	0.39	0.07	0.03	0.02	0.08	0.18	15.16 ± 1.19
Hawkes Bay	0.00	0.09	7.30	0.08	**24.09**	1.33	0.05	0.11	0.12	0.69	0.10	0.39	34.36 ± 1.97
Wellington	0.15	0.55	3.31	0.40	1.88	**39.81**	1.2	0.85	0.54	1.26	1.12	0.34	51.41 ± 2.65
Nelson/Marlborough	0.02	0.14	0.28	0.00	0.00	0.12	**24.66**	2.56	1.21	1.71	0.57	0.51	31.78 ± 1.86
West Coast	0.02	0.12	0.00	0.20	0.38	0.03	0.79	**26.71**	1.62	1.13	1.18	0.39	32.57 ± 1.90
North Canterbury	0.45	0.10	0.66	0.04	0.15	0.06	4.09	7.72	**166.57**	45.00	6.12	2.63	233.59 ± 9.07
Central South Island	0.00	0.03	0.34	0.05	0.11	0.05	0.95	2.21	20.71	**152.52**	8.80	1.95	187.72 ± 7.87
Otago	0.04	0.22	0.63	0.29	0.23	0.39	0.73	1.40	2.07	31.49	**175.73**	15.29	228.59 ± 9.86
Southland	0.13	0.00	0.37	0.00	0.16	0.02	0.24	0.18	0.45	3.92	18.62	**113.74**	137.84 ± 5.93
New Zealand	0.01	0.22	1.23	0.10	0.04	0.23	0.08	0.07	0.17	1.12	0.49	0.10	3.85 ± 0.83
Overseas	0.00	0.88	6.14	0.54	3.61	0.65	6.65	8.21	4.61	10.76	9.54	17.46	69.06 ± 2.83
Total	**3.65 ± 0.55**	**30.72 ± 2.45**	**215.66 ± 8.55**	**16.92 ± 1.39**	**36.1 ± 2.59**	**45.08 ± 2.58**	**41.09 ± 2.09**	**51.27 ± 2.41**	**200.05 ± 8.6**	**252.19 ± 9.02**	**224.97 ± 9.41**	**153.71 ± 6.19**	**1 271.44 ± 19.68**

the dominant movement was from Auckland/Waikato to the Eastern Region. For many Regions cross boundary fishing tended to cancel out, so that the total effort expended within each Region was often roughly the same as (i.e., within 10% of) the total effort expended by licence holders originating from that Region. The main exceptions were Northland, West Coast, and Central South Island, for which there were significant gains in net effort associated with cross-boundary fishing, and Auckland/Waikato and North Canterbury (for which the reverse was true).

New Zealand resident licence holders who did not affiliate with a specific Region made only a modest contribution to the total effort (3 850 ± 830 angler days, or 0.3% of the total. This effort was disproportionately skewed towards the Eastern and Central South Island Regions, which jointly accounted for 60.8% of the total for this group compared to 37.4% for all other New Zealand residents.

3.4.3. Overseas visitors

The 69 100 angler-days expended by overseas visitors in 2007/08 represented 5.43% of the total effort recorded during the survey, but analysis of this effort by fishing Region and water type suggested that their pattern of fishing activity differed markedly from that of New Zealand residents (Tables 11, 12). Visitors showed a strong preference for South Island waters (57 200 ± 2 500 angler-days; 83% of total effort; Table 11), and an equally strong preference for river fisheries as opposed to lake fisheries (56 400 ± 2 600 angler-days; 82% of total effort; Table 12). In absolute terms their most frequently fished Region was Southland (17 500 ± 1 800 angler-days; 25.3% of total effort), but all other South Island regions except North Canterbury attracted at least 5 000 visits. Eastern was the only North Island Region to attract a similar level of effort (6 100 ± 900 angler-days), with Hawkes Bay the only other North Island region to attract more than 1 000 visits (Table 11). However, when expressed as a proportion of the total effort expended within each fishing region by all anglers, the contribution from overseas visitors was most significant in the Nelson/Marlborough and West Coast regions, where visitors to New Zealand accounted for over 15% of the total effort (Table 11).

More detailed analysis of visitor angling patterns by water-type further highlights these differences (Table 12). Overseas visitors showed a marked preference for back country and headwater river fisheries, which accounted for 41.0% of their total effort as compared to 9.4% for their New Zealand counterparts. Across the whole country, overseas visitors accounted for 18.9% (20 700 of 109 200 angler-days) expended on back-country river fisheries, and 23.8% (8 300 of 34 800 angler-days) expended on headwater river fisheries.

Table 11. **Distribution of estimated angling effort (thousands of angler-days ± 1 SE) in 2007/2008 by fishing Region and angler origin (New Zealand resident vs. overseas visitor). Percentages shown for the first three columns show the effort expended in each Region as a percentage of the national total; thus New Zealand residents expended 11.3% of their effort in the Southland Region, whereas overseas visitors expended 25.3% of their effort in this Region. The final column shows the effort expended by overseas visitors in each Region as a percentage of the total effort in that Region; thus overseas visitors accounted for 11.4% of the effort expended within the Southland Region.**

Region	Total	NZ resident	Overseas visitor	% o'seas
Northland	4.0 ± 0.6 (0.3%)	3.7 ± 0.5 (0.3%)	0.0 ± 0.0 (0.0%)	0.0%
Auckland/Waikato	30.7 ± 2.4 (2.4%)	29.8 ± 2.4 (2.5%)	0.9 ± 0.2 (1.3%)	2.9%
Eastern	215.6 ± 8.6 (17.0%)	209.5 ± 8.5 (17.4%)	6.1 ± 0.9 (8.9%)	2.8%
Taranaki	16.9 ± 1.6 (1.3%)	14.9 ± 1.3 (1.4%)	0.5 ± 0.2 (0.8%)	3.2%
Hawkes Bay	36.1 ± 2.6 (2.8%)	32.5 ± 2.4 (2.7%)	3.6 ± 0.9 (5.2%)	10.0%
Wellington	45.1 ± 2.6 (3.5%)	44.4 ± 2.6 (3.7%)	0.7 ± 0.2 (0.9%)	1.4%
Nelson/Marlborough	41.1 ± 2.1 (3.2%)	34.4 ± 2.0 (2.9%)	6.6 ± 0.7 (9.6%)	16.1%
West Coast	51.3 ± 2.4 (4.0%)	44.5 ± 2.3 (3.6%)	8.2 ± 0.8 (11.9%)	16.0%
North Canterbury	200.1 ± 8.6 (15.7%)	195.4 ± 8.6 (16.3%)	4.6 ± 0.6 (6.7%)	2.3%
Central South Island	251.4 ± 9.0 (19.8%)	240.7 ± 8.9 (20.1%)	10.8 ± 0.9 (15.6%)	4.3%
Otago	224.9 ± 9.4 (17.7%)	215.4 ± 9.4 (17.9%)	9.5 ± 0.9 (13.8%)	4.2%
Southland	153.7 ± 6.2 (12.1%)	136.3 ± 5.9 (11.3%)	17.4 ± 1.8 (25.3%)	11.4%
Total	**1 271.4 ± 19.7**	**1 202.4 ± 19.5**	**69.0 ± 2.8**	**5.4%**

Table 12: **Distribution of estimated angling effort (thousands of angler-days ± 1 SE) in 2007/2008 by fishery type and angler origin (New Zealand resident vs. overseas visitor). The final column shows the effort expended by overseas visitors as a percentage of the total for that water type; thus overseas visitors accounted for 18.9% of the effort expended on back country river fisheries.**

	Type of fishery	All anglers	New Zealand residents	Overseas visitors	% by overseas visitors
Rivers	Mainstem river	450.3 ± 12.2	428.7 ± 12.1	21.7 ± 1.9	4.8%
	Lowland river	122.7 ± 6.2	117.3 ± 6.1	5.4 ± 0.6	4.5%
	Back country	107.8 ± 4.1	87.1 ± 3.8	20.7 ± 1.5	18.9%
	Headwater	33.4 ± 2.3	25.1 ± 2.1	8.3 ± 0.8	24.8%
	Canal	13.1 ± 2.3	12.8 ± 2.3	0.4 ± 0.2	2.8%
	Total, all rivers	727.4 ± 14.6	671.0 ± 14.4	56.4 ± 2.6	7.7%
Lakes	Large lake	332.8 ± 10.6	326.4 ± 10.6	6.5 ± 0.8	1.9%
	Reservoir	165.0 ± 7.2	162.1 ± 7.2	2.9 ± 0.5	1.7%
	Small lake	46.2 ± 2.8	42.9 ± 2.7	3.2 ± 0.6	7.0%
	Total, all lakes	544.0 ± 13.2	531.4 ± 13.1	12.6 ± 1.1	2.3%
Total, all waters		**1 271.4 ± 19.7**	**1 202.4 ± 19.5**	**69.0 ± 2.8**	**5.4%**

3.5. Trends in Usage 1994/1995 – 2007/2008

To highlight trends in usage over the c. 14 years covered by the 1994/1995, 2001/2002 and 2007/2008 surveys, we merged usage estimates for all three surveys into a single dataset, updating records for the two earlier surveys as necessary to reflect minor changes in the survey methodology (such as recognition of multi-reach rivers from 2001/2002 onwards). These analyses were restricted to New Zealand resident anglers only so as to ensure consistency between the three surveys, for which total estimated effort for the 2007/2008 season was 1 202 000 ± 19 500 angler-days. Regional totals for 2007/2008 as presented in this section thus underestimate the total usage as tabulated in Appendix 1 and elsewhere in this report, but are unbiased with respect to annual trends.

Taking the above differences into consideration, total angling effort over all twelve FGNZ Regions over the period of record was 1.156 million angler-days in 1994/96, 1.111 million angler-days in 2001/02, and 1.202 million angler-days in 2007/2008 (Table 13). The 1994/1995 figure is almost exactly equal to the long-term average, with the 2001/2002 and 2007/2008 figures deviating from this average by -45 000 (-3.9%) and 46 000 (+3.9%) angler-days, respectively, suggesting that the total effort devoted to freshwater fishing in New Zealand has remained approximately constant during this period. However, much more pronounced trends were apparent at Regional level, with a consistent decline in effort apparent in some Regions (e.g., Auckland/Waikato, Eastern, Nelson/Marlborough, a consistent increase in others (e.g., West Coast, Central South Island), and no evidence of any clear long term in others (e.g., Taranaki, North Canterbury, Otago). In the remainder of this section we briefly review these trends Region by Region, generally focussing on specific types of fishery (e.g., back country rivers, lowland rivers) rather than individual lakes or rivers[6].

3.5.1. Northland

The Northland Region is the smallest in the country in terms of licence sales and number of viable fisheries, and was not surveyed in 1994/1995. Total effort in 2007/2008 (4030 angler-days) was roughly double that in 2001/02 (1870 angler-days), with most of the increase being associated with river fishing. Effort on rivers rose from 530 days on 15 rivers in 2001/2002 to 1920 days on 25 rivers in 2007/2008.

[6] Water types used to characterise mainstem rivers which were subdivided into distinct reaches for survey purposes sometimes differ between reaches. For example, the Oreti River is classified as a mainstem fishery in its lower reaches, but a back country fishery in its upper reaches. These distinctions were not recognised in the 1994/1995 survey, creating some potential for minor inconsistencies between the results in this report, and those in the two previous reports. Other inconsistencies can arise when respondents did not specify which reach they fished, to that their effort cannot be unambiguously assigned to a particular water type. However, all such errors are small, and have been ignored for the purposes of this section.

Table 13: Annual and regional trends in estimated annual usage by New Zealand resident anglers (angler-days × 1000 ± 1 SE), 1994/1995 to 2007/2008, by fishing Region and fishery type.

FGNZ Region	Type of fishery	1994/1995	2001/2002	2007/2008
Northland	Small lake		1.2 ± 0.5	1.2 ± 0.3
	Lowland river	not surveyed	0.5 ± 0.1	1.9 ± 0.4
	Reservoir		0.1 ± 0.0	0.5 ± 0.3
	Total		**1.9 ± 0.5**	**3.7 ± 0.6**
Auckland/Waikato	Lowland river	19.0 ± 1.3	17.9 ± 1.2	13.0 ± 1.0
	Reservoir	15.3 ± 1.3	14.8 ± 1.2	8.2 ± 1.9
	Mainstem river	10.9 ± 1.8	6.3 ± 0.9	7.1 ± 1.1
	Small lake	3.4 ± 0.5	2.3 ± 0.5	1.6 ± 0.4
	Total	**58.6 ± 2.6**	**41.3 ± 2.0**	**29.8 ± 2.4**
Eastern	Large lake	168.0 ± 7.6	155.7 ± 5.4	150.1 ± 6.8
	Lowland river	27.3 ± 3.7	28.6 ± 3.1	28.2 ± 4.5
	Reservoir	23.9 ± 2.3	17.4 ± 3.0	8.9 ± 1.2
	Mainstem river	9.3 ± 1.7	11.1 ± 2.2	5.7 ± 1.0
	Headwater	7.7 ± 1.1	4.5 ± 0.6	7.5 ± 1.5
	Back country	4.0 ± 0.8	8.0 ± 1.7	4.6 ± 0.8
	Small lake	5.5 ± 1.3	5.0 ± 1.3	3.5 ± 0.7
	Canal	1.1 ± 0.4	1.1 ± 0.5	1.0 ± 0.6
	Total	**246.7 ± 9.1**	**231.3 ± 7.6**	**209.5 ± 8.5**
Taranaki	Lowland river	4.7 ± 0.4	3.7 ± 0.4	7.0 ± 0.6
	Back country	3.2 ± 0.4	1.4 ± 0.2	3.1 ± 0.5
	Reservoir	1.6 ± 0.2	1.3 ± 0.2	2.9 ± 0.9
	Small lake	1.7 ± 0.2	1.1 ± 0.3	1.3 ± 0.5
	Mainstem river	1.8 ± 0.5	0.4 ± 0.2	2.3 ± 0.4
	Headwater	0.1 ± 0.1	0.0 ± 0.0	0.1 ± 0.0
	Total	**13.1 ± 0.9**	**8.0 ± 0.6**	**16.9 ± 1.3**
Hawkes Bay	Mainstem river	21.6 ± 0.5	28.6 ± 1.7	16.5 ± 1.2
	Lowland river	11.5 ± 0.3	12.0 ± 1.0	7.9 ± 0.7
	Small lake	3.3 ± 0.2	2.4 ± 0.4	2.3 ± 0.8
	Back country	0.0 ± 0.0	1.9 ± 0.4	4.0 ± 1.8
	Headwater	1.5 ± 0.1	1.4 ± 0.2	1.4 ± 0.4
	Reservoir	0.0 ± 0.0	0.2 ± 0.1	0.2 ± 0.2
	Total	**37.8 ± 0.6**	**46.5 ± 2.1**	**32.5 ± 2.4**
Wellington	Mainstem river	45.0 ± 2.7	32.9 ± 1.9	28.6 ± 2.1
	Lowland river	13.3 ± 1.2	7.4 ± 0.6	10.2 ± 1.3
	Back country	3.6 ± 0.6	2.9 ± 0.6	4.2 ± 0.7
	Small lake	5.0 ± 1.1	1.5 ± 0.4	0.9 ± 0.4
	Reservoir	0.9 ± 0.2	0.6 ± 0.2	0.1 ± 0.1
	Large lake	0.2 ± 0.1	0.2 ± 0.1	0.1 ± 0.1
	Canal	0.1 ± 0.1	0.0 ± 0.0	0.2 ± 0.2
	Headwater	0.0 ± 0.0	0.0 ± 0.0	0.1 ± 0.0
	Total	**68.0 ± 3.2**	**45.3 ± 2.1**	**44.4 ± 2.6**

FGNZ Region	Type of fishery	1994/1995	2001/2002	2007/2008
Nelson/Marlborough	Mainstem river	23.6 ± 1.7	15.3 ± 1.1	11.0 ± 1.0
	Back country	7.3 ± 0.8	11.1 ± 1.0	10.9 ± 1.0
	Lowland river	10.1 ± 0.9	6.4 ± 0.5	5.7 ± 0.9
	Large lake	3.1 ± 0.6	4.3 ± 0.5	3.6 ± 0.7
	Reservoir	1.7 ± 0.3	1.2 ± 0.2	0.8 ± 0.2
	Headwater	1.3 ± 0.2	1.2 ± 0.2	1.2 ± 0.2
	Small lake	0.7 ± 0.4	0.4 ± 0.2	0.5 ± 0.2
	Canal	0.0 ± 0.0	0.2 ± 0.2	0.7 ± 0.6
	Total	**47.9 ± 2.2**	**40.1 ± 1.8**	**34.4 ± 2.0**
West Coast	Back country	10.6 ± 1.0	12.7 ± 0.8	12.6 ± 1.0
	Large lake	6.2 ± 0.7	10.5 ± 0.9	12.4 ± 1.4
	Mainstem river	3.0 ± 0.4	6.4 ± 0.7	10.8 ± 1.2
	Headwater	2.9 ± 0.5	2.7 ± 0.4	3.5 ± 0.6
	Small lake	1.3 ± 0.2	1.4 ± 0.2	3.1 ± 0.4
	Lowland river	0.3 ± 0.1	0.6 ± 0.2	0.5 ± 0.1
	Reservoir	0.0 ± 0.0	0.0 ± 0.0	0.2 ± 0.1
	Canal	0.0 ± 0.0	0.1 ± 0.1	0.0 ± 0.0
	Total	**24.4 ± 1.4**	**34.4 ± 1.5**	**43.1 ± 2.3**
North Canterbury	Mainstem river	111.6 ± 8.7	78.0 ± 4.8	139.9 ± 7.7
	Lowland river	30.7 ± 3.5	12.3 ± 1.2	16.6 ± 2.7
	Small lake	11.2 ± 1.4	10.4 ± 0.7	15.4 ± 1.8
	Large lake	8.2 ± 1.4	10.2 ± 0.9	15.2 ± 1.7
	Back country	2.4 ± 0.7	5.0 ± 0.5	7.1 ± 1.0
	Headwater	0.3 ± 0.3	1.1 ± 0.3	1.1 ± 0.4
	Canal	2.3 ± 1.2	0.0 ± 0.0	0.0 ± 0.0
	Reservoir	0.0 ± 0.0	1.0 ± 0.5	0.2 ± 0.1
	Total	**166.7 ± 9.7**	**118.0 ± 5.2**	**195.4 ± 8.6**
Central South Island	Mainstem river	93.1 ± 4.4	59.2 ± 3.8	83.8 ± 5.7
	Reservoir	27.9 ± 2.3	41.1 ± 2.5	90.5 ± 5.7
	Large lake	12.2 ± 1.4	26.5 ± 2.1	26.9 ± 2.5
	Lowland river	16.4 ± 1.5	10.6 ± 1.3	7.0 ± 1.0
	Back country	8.6 ± 1.0	11.4 ± 1.1	11.9 ± 1.2
	Canal	2.0 ± 0.7	14.5 ± 2.4	10.8 ± 2.2
	Small lake	5.1 ± 0.9	4.3 ± 0.6	8.2 ± 1.3
	Headwater	0.7 ± 0.3	0.9 ± 0.2	2.4 ± 0.5
	Total	**166.1 ± 5.6**	**168.5 ± 5.9**	**241.4 ± 8.9**
Otago	Large lake	66.1 ± 3.9	72.8 ± 4.8	82.3 ± 6.7
	Mainstem river	41.4 ± 3.6	54.4 ± 4.9	52.3 ± 4.9
	Reservoir	36.3 ± 2.1	42.7 ± 3.5	49.5 ± 3.6
	Back country	15.8 ± 1.9	22.4 ± 2.8	13.9 ± 1.7
	Lowland river	17.8 ± 2.2	17.1 ± 2.5	11.0 ± 1.6
	Headwater	2.7 ± 0.4	5.2 ± 0.8	4.3 ± 0.7
	Small lake	2.8 ± 0.6	4.4 ± 1.0	2.1 ± 0.4
	Total	**182.9 ± 6.5**	**218.7 ± 8.7**	**215.4 ± 9.4**
Southland	Mainstem river	97.5 ± 4.3	92.3 ± 4.8	72.2 ± 4.5
	Large lake	21.7 ± 1.7	27.8 ± 2.5	36.2 ± 3.2
	Back country	18.4 ± 1.5	23.1 ± 2.0	15.4 ± 1.5
	Lowland river	8.8 ± 1.0	5.5 ± 0.9	6.5 ± 1.3
	Headwater	4.4 ± 0.8	5.3 ± 1.0	3.7 ± 0.7
	Small lake	2.0 ± 0.4	3.1 ± 0.7	2.8 ± 0.5
	Total	**152.8 ± 5.1**	**157.1 ± 5.9**	**135.9 ± 5.9**
All Regions	**Total**	**1 155.5 ± 17.4**	**1 110.7 ± 15.8**	**1 202.4 ± 19.5**

Artificial reservoirs also appear to provide an increasingly important angling resource, with a marked increase in effort on the Whau Valley Dam near Whangarei, and the first records of effort on the recently completed Wilsons Dam near Ruakaka. Lake fishing was confined to the Kaiiwi Lakes and Lake Manuwai, with no change in total effort since 2001/02.

3.5.2. Auckland/Waikato

Angling effort in the Auckland/Waikato Region has declined markedly over the period of record, falling from 50 400 ± 2 600 angler-days in 1994/1995 to 29 800 ± 2 400 angler-days in 2007/2008. This decline (averaging 41%) appears to have been relatively consistent across all water types represented within the region, i.e., lowland rivers (32%), mainstem rivers (45%), reservoirs (46%), and small lakes (53%). Much of this decline appeared to be specific to the Waikato River catchment, particularly with respect to reservoir fisheries (i.e., Lakes Waipapa, Karapiro, and Arapuni) and also lowland river fisheries (e.g., Mangatutu Stream, Puniu River, Waipa River), the most common type of fishing water within the region.

Despite this decline, the total effort recorded by licence holders from the Auckland/Waikato Region in 2007/2008 (52 040 ± 3 020 angler-days) was similar to that in 2001/2002 (53 780 ± 2 290 angler-days) when their fishing in other Regions was taken into account (Table 10; c.f. Unwin & Image 2003). However, Auckland/Waikato licence holders now spend a lower proportion of their total effort within their own Region (48.0%) than those from any other Region, suggesting an increasing tendency to travel to other Regions to pursue their angling interests. For example, the proportion of their total effort expended within the eastern Region rose from 27.9% in 2001/2002 to 35.3% in 2007/2008, with 4 970 ± 1 120 angler-days spent in the South Island in 2007/2008 compared to 1 390 ± 330 in 2001/2002.

3.5.3. Eastern

The Eastern Region also experienced a significant decline in total effort since the 1994/1995 survey, from 246 700 ± 9 100 to 209 500 ± 8 500 angler-days in 2007/2008 (Table 13). In contrast to the Auckland/Waikato Region, this decline was almost solely associated with lake fisheries, for which total effort fell from 197 300 ± 8 000 angler-days in 1994/95 to 162 500 ± 6 900 angler-days in 2007/2008. The most pronounced individual decline occurred on Lake Aniwhenua, for which estimated usage fell by 80% from 1994/1995 (11 330 ± 1 640 angler-days) to 2007/2008 (2 300 ± 500 angler-days), but substantial declines were also apparent on Lakes Tarawera, Rerewhakaaitu, and Ohakuri (Appendix 1). By contrast, usage of Lake Rotoehu and Rotoma increased substantially over the same period, while other lakes (e.g., Rotoiti,

Rotorua, Tarawera) showed no consistent long term trend. Unlike their counterparts in Auckland/Waikato, Eastern licence holders showed only a moderate tendency to travel to other regions for their fishing (Table 10), expending only 9.2% of the effort outside the Eastern region.

3.5.4. Taranaki

Angling effort within the Taranaki Region almost doubled from 2001/2002 to 2007/2008, increasing from 7 620 ± 590 to 14 910 ± 1 330 angler-days (Table 13). The Taranaki fishery is dominated by the rivers of the Taranaki ring plain, about fifty of which sustain recognised lowland or back country fisheries and were responsible for most of the increase in effort. Much of this increase appears to have been relatively evenly distributed throughout the region, particularly when allowance is made for the broad confidence intervals associated with estimates of ~500 angler-days or less, but a few of the more heavily used rivers (e.g., Manganui, Patea, Waiwhakaiho) showed definite evidence of an increase in effort since 2001/2002. A relatively high proportion of the effort recorded in 2007/2008 came from anglers visiting from other regions, who contributed 3 600 ± 720 angler-days (24%) of the total (Table 10).

3.5.5. Hawkes Bay

Total estimated effort for the Hawkes Bay Region in 2007/2008 32 360 ± 2 430 angler-days) was markedly lower than in 2001/2002 (46 390 ± 2 100 angler-days), although the 1994/95 total for this region (which was intermediate between these two values; Table 13) was estimated from incomplete data and is subject to considerable uncertainty (Unwin & Brown 1998). The Hawkes Bay fishery is dominated by four major catchments (the Mohaka, Ngaruroro, Tukituki, and Tutaekuri), with a total of forty recognised river fisheries between them. Of these, the Tukituki and Ngaruroro showed evidence of significant declines in usage since 2001/2002, by over 50% in the case of the Tukituki, with a more modest decline apparent on the Tutaekuri. The Mohaka was the only catchment in which usage increased, with virtually all of this increase associated with the Mohaka mainstem itself. As with the Taranaki Region, approximately one quarter (25.6%) of the effort recorded in Hawkes Bay (by New Zealand residents) was contributed by licence holders from other regions.

3.5.6. Wellington

In common with the other two lower North Island Regions (Taranaki and Hawkes Bay), the Wellington Region is dominated by river fisheries, with four major catchments (Ruamahanga, Hutt, Manawatu, and Rangitikei) and fifty recognised

tributaries or minor catchments. Total estimated usage for 2007/2008 was almost identical to 2001/2002, but markedly less than in 1994/1995 (Table 13). The decline from 1994/1995 to 2001/2002, and its continuance into 2007/2008, was associated with the Hutt River catchment, for which total usage fell from 20 210 ± 2 030 angler-days in 1994/1995, to 6 580 ± 850 angler-days in 2001/2002, and then to 4 030 ± 620 angler-days in 2007/2008. By contrast, usage of the other major catchments showed either a moderate decline (Ruamahunga), or no significant change (Manawatu and Rangitikei). As with Auckland/Waikato licence holders, Wellington anglers fished extensively outside the Wellington region, expending 12.2% of their effort (6 270 angler-days) in other North Island regions, and 10.4% (5 340 angler-days) in the South Island. Most visitors to the Wellington region were from the Eastern, Taranaki, or Hawkes Bay regions, and tended to devote most of their effort (2 100 out of 3 220 angler-days) to the Rangitikei River.

3.5.7. Nelson/Marlborough

Angling effort expended in the Nelson/Marlborough region by New Zealand residents has declined steadily since 1994/1995, falling by 16% (47 870 ± 2 220 to 40 110 ± 1 770 angler-days) from 1994/1995 to 2001/2002, and by a further 14% (to 34 440 ± 1 970 angler-days) in 2007/2008 (Table 13). This decline has been most apparent in mainstem and lowland river fisheries, for which combined usage in 2007/2008 (17 230 ± 1 340 angler-days) was only 51% of the equivalent 1994/1995 total (33 740 ± 1 930 angler-days). Activity levels for other fisheries within the region, most of which are associated either with back country and headwater rivers or one of the two Buller source lakes, have remained essentially unchanged.

Analysis of individual Nelson/Marlborough rivers (Appendix 1) suggests that the decline in mainstem river usage is primarily confined to the Motueka and Buller Rivers, usage of which has fallen by 59% and 74%, respectively, since 1994/1995. By contrast, usage of the Wairau River remains virtually changed and may have even increased slightly, and usage of the only other large mainstem river in the region (the Clarence) has increased markedly.

Despite these events, the region remains popular with anglers from elsewhere in New Zealand, who contributed 9 780 ± 1 040 angler-days to the 2007/2008 total effort. In addition, the region was also popular with overseas visitors, who contributed a further 6 600 ± 700 angler-days and accounted for 16.2% of the total effort in this region by all anglers irrespective of origin (Table 11).

3.5.8. West Coast

Angling activity in the West Coast region has risen markedly since 1994/1995, increasing by 10 000 angler-days per year from 1994/1995 to 2001/2002, and by a similar amount from 2001/2002 to 2007/2008 (Table 13). Just under 40% of the 2007/2008 total for New Zealand resident anglers (16 350 ± 1 500 angler-days) came from visiting anglers from other regions, with overseas anglers contributing a further 8 250 angler-days. Taking all visitor contributions into account, just under half of the effort recorded (48.0% of 51 270 angler-days) came from outside the region (Table 10).

The increase in usage was common to lake and river fisheries and appears to have been broadly based, with only a few individual waters (e.g., Lake Brunner, Hokitika River) showing clear evidence of a marked increase (Appendix 1). Much of the increase appears to have been dispersed throughout the region, as evidenced by a steady rise in the number of individual fisheries visited each year, which numbered 89, 95, and 110 in 1994/1995, 2001/2002, and 2007/2008, respectively. The 2007/2008 total was also remarkable for the number of new fisheries added to the survey database to record the efforts of overseas visitors, who identified four West Coast fisheries which had not previously been fished by New Zealand residents.

3.5.9. North Canterbury

Estimated angling activity within the North Canterbury region has fluctuated markedly since 1994/1995, making it easily the most volatile of the twelve FGNZ regions in terms of annual variability (Table 13). This derives almost entirely from the Chinook salmon fishery, which dominates the region to a greater extent than in any other part of the country and is renowned for its unpredictability (Deans et al. 2004, Unwin 1997). Combined annual usage for the two major salmon rivers (the Waimakariri and Rakaia) fell by 22 600 angler-days from 1994/1995 to 2001/2002, followed by an increase of 57 400 angler-days in 2007/2008 (Appendix 1). In a national context, variations of this magnitude are equivalent to the total annual effort in a medium sized region such as Auckland/Waikato, Hawkes Bay, or Nelson/Marlborough, emphasising the significance of the salmon fishery for the North Canterbury region. Thanks largely to this increase, total effort within the region rose by 77 500 angler-days from 2001/02 to 2007/08.

The North Canterbury fishery attracted considerable effort (20 710 ± 2 310 angler-days) from the neighbouring Central South Island region, representing 10.6% of the total for New Zealand residents, with overseas visitors contributing a further 4 600 ± 590 angler-days (Table 10). By contrast, North Canterbury licence holders expended

65 550 ± 3 940 angler-days in other South Island regions, including 45 000 ± 3 560 angler-days in Central South Island, and 7 720 ± 1 040 angler-days on the West Coast (Table 10). In this respect they are the most mobile anglers in the South Island, expending a higher proportion of their annual effort (28.7%) fishing outside their home region than any other group.

3.5.10. Central South Island

Total effort within the Central South Island region rose by 73 200 angler-days from 2001/2002 to 2007/2008, an almost identical increase to that recorded in the neighbouring North Canterbury region (Table 13). However, unlike North Canterbury, this increase was predominantly due to increased pressure on lake fisheries, which rose by 53 800 angler-days compared to an increase of 19 400 angler-days for river fisheries. This increase, in turn, was strongly associated with a dramatic increase in estimated usage of Lake Benmore, which rose from 21 740 ± 1 680 angler-days in 2001/2002 to 58 850 ± 4 590 angler-days in 2007/2008 (Appendix 1). Smaller but significant increases were recorded in other artificial reservoir fisheries, notable Lakes Aviemore, Ruataniwha, and Opuha. These increases continue a trend which was also apparent, albeit more weakly, from 1994/1995 to 2001/2002 (Table 13). By contrast, river fisheries showed no evidence of a consistent long term trend in usage, with total usage for 2007/2008 similar to (and possibly slightly lower than) the 1994/1995 total. In particular, little change in total usage was apparent on the Waitaki River, in contrast to the Rangitata River which mirrored the pattern shown by the two main North Canterbury salmon fisheries (Appendix 1). Lowland fisheries continued to decline in total usage, with particularly marked declines apparent on the Orari and Waihi Rivers.

The Central South Island region was also notable for the relatively high proportion of the total effort recorded by visiting anglers, both from elsewhere in New Zealand (88 900 ± 5 130 angler-days), and from overseas visitors ((10 750 ± 940 angler-days; Table 10). Much of this effort came from the adjacent North Canterbury and Otago regions, but the region also attracted 12 400 angler-days from more distant New Zealand regions. By contrast, Central South Island licence holders expended only 35 210 ± 2 770 angler-days fishing outside their home region (Table 10), resulting in a net gain in effort (i.e., visitor effort minus “emigrant” effort) of 53 710 angler-days across the region as a whole.

3.5.11. Otago

The Otago region was characterised by stable usage levels from 2001/2002 to 2007/2008, with a moderate increase in lake usage almost exactly balanced by an

equivalent decrease in river usage (Table 13). The three upper Clutha source lakes continued to attract large numbers of anglers, with a particularly marked increase in effort on Lake Wanaka (from 25 270 ± 2 310 angler days in 2001/2002 to 39 070 ± 5 710 angler-days in 2007/2008), and collectively accounted for 38% of the effort expended in Otago by New Zealand resident anglers. Irrigation and hydro-electric reservoirs were also a significant resource, accounting for 49 530 ± 3 590 angler-days or just under one quarter (23%) of the total effort. Just over half of this total (52.6%) was recorded on Lake Dunstan, with the remainder (23 500 angler-days) distributed among 21 smaller reservoirs in the Taieri, Clutha, and Dunedin City catchments.

Effort on river fisheries fell by 17 230 days from 2001/2002 to 2007/2008, to a level (81 580 ± 5 440 angler-days) similar to that recorded in 1994/1995 (77 690 ± 4 630 angler-days). However, there was little evidence of any consistent long term trends relative to specific river types (Table 13). Mainstem fishing in the Clutha River increased sharply from 1994/1995 to 2001/2002 but has remained unchanged since then, while usage of the Taieri River (including the upper reaches, which are classified as a back country fishery) fell slightly from 2002/2002 to 2007/2008 but remains well above the 1994/1995 total (Appendix 1). Effort on back country river fisheries fell substantially from 2001/2002 to 2007/2008, but this seems to have been associated with a sharp decline in a few specific rivers (notably the Hawea and Manuherikia; see Appendix 1) rather than a general decline across the whole Otago region. Similar comments apply to Otago lowland river fisheries, where a moderate decline in effort since 2001/2002 appears to reflect either local changes on individual rivers (e.g., the Pomahaka) or possible anomalies in the 2001/2002 results (e.g., Tokomairiro).

The Otago region attracted considerable effort from Southland anglers, and to a lesser extent from Central South Island and North Canterbury, but was relatively lightly fished (total effort 6 160 ± 1 060 angler-days) by New Zealand resident anglers from further afield (Table 10). Likewise, Otago licence holders expended 20% of their effort (46 840 angler-days) fishing in Southland or Central South Island, but only 2.6% (5 990 angler-days) outside these three regions. By contrast, the Otago region attracted the third highest usage by overseas visitors to New Zealand (9 510 ± 880 angler-days), being exceeded only by Central South Island and Southland (Table 10).

3.5.12. Southland

The Southland region experienced a moderate fall in total effort by New Zealand resident anglers in 2007/2008, by around 16 500 angler-days relative to 1994/1995, and 20 800 angler-days relative to 2001/2002 (Table 13). A consistent rise in lake fishing (from 23 700 to 38 600 angler-days) was more than offset by a fall in river fishing effort, from 129 100 to 97 700 angler-days over the same period. The main

contributor to the increase in lake fishing was Lake Te Anau, usage of which has more than doubled since 1994/1995 (Appendix 1). Likewise, although many rivers showed considerable interannual variation in estimated usage, only one river – the Mataura – showed evidence of a strong decline specific to the 2007/2008 season (Appendix 1). By contrast, usage figures for other large Southland rivers showed either little if any change since 2001/2002 (Oreti and Aparima), or a modest increase (Waiau).

As with Otago anglers, Southland anglers moved freely between the Southland and Otago regions, expending 13.5% of their effort (18 620 angler-days) in Otago but seldom travelling much further (Table 10). The Southland region was also striking for the effort contributed by overseas visitors (17 450 ± 1 780 angler-days), which was more than double the figure for New Zealand resident anglers from outside Otago and Southland (7 140 ± 930 angler-days).

3.5.13. Influence of didymo

To gauge the extent to which effort on individual river fisheries may have been influenced by the arrival of the invasive aquatic diatom *Didymosphenia geminata* (didymo) in New Zealand between the 2001/2002 and 2007/2008 surveys (Kilroy 2004, 2008), we cross-tabulated annual usage for 33 selected South Island rivers in relation to the presence or absence of didymo. For tabulation purposes we considered any record of didymo as a positive, irrespective of whether it was abundant enough to have significant nuisance value (e.g., the Waitaki, Waiau, and Mararoa Rivers) or had merely been recorded microscopically or at worst locally with no evidence of sustained blooming throughout the whole river (e.g., Oreti, Matuara) river.

This analysis highlights the extent to which usage of individual fisheries can vary from year to year (Table 14), but shows little consistent patterns in relation to known didymo incursions. Some infected rivers (e.g., Mararoa, Hawea, Buller, Mataura, Motueka, Manuherikia) show evidence of a significant decline in usage from 2001/2002 to 2007/2008, irrespective of infestation levels, but others have either shown little change (e.g., Clutha, Oreti, Ahuriri, Aparima) or have experienced a moderate increase (e.g., Waiau, Twizel, Clarence, Opihi). Of the main east coast salmon-producing rivers, total effort on the Waitaki River (where didymo was first detected in 2006) changed little if at all since 2001/2002, in marked contrast to the Rakaia and Rangitata Rivers (first detection in 2007) and the Waimakariri (currently free of didymo).

The absence of any clear trend in relation to known didymo incursions indicates that its presence is only one of a suite of factors which potentially influence angling usage

Table 14: **Annual trends in estimated annual usage of 33 South Island rivers by New Zealand resident anglers (angler-days ± 1 SE), 1994/1995 to 2007/2008, in relation to year of first recorded incursion of Didymosphenia geminata (Year).**

Year	River	1994/1995	2001/2002	2007/2008
2004	Waiau River	7 720 ± 840	14 660 ± 1 500	17 300 ± 2 270
2004	Mararoa River	2 230 ± 380	2 970 ± 590	1 520 ± 330
2005	Clutha River	26 340 ± 3 210	37 320 ± 4 160	38 090 ± 3 930
2005	Hawea River	1 920 ± 470	4 970 ± 1 310	710 ± 310
2005	Oreti River	27 180 ± 2 300	20 620 ± 2 110	19 270 ± 1 910
2005	Whitestone River	710 ± 350	470 ± 130	1 150 ± 400
2005	Buller River	5 060 ± 680	4 310 ± 520	2 640 ± 390
2006	Waitaki River	34 500 ± 3 150	27 580 ± 2 640	28 460 ± 3 550
2006	Ahuriri River	2 590 ± 720	2 900 ± 580	2 730 ± 600
2006	Twizel River	720 ± 360	1 250 ± 320	3 200 ± 610
2006	Fraser River	410 ± 150	530 ± 390	1 380 ± 520
2006	Mataura River	51 360 ± 3 260	52 960 ± 3 950	32 460 ± 3 330
2006	Aparima River	11 280 ± 1 440	6 750 ± 970	6 950 ± 1 040
2006	Upukerora River	630 ± 180	1 190 ± 370	1 370 ± 380
2007	Motueka River	10 070 ± 1 330	6 390 ± 660	4 100 ± 490
2007	Clarence River	840 ± 370	620 ± 170	2 740 ± 670
2007	Hurunui River	17 100 ± 3 330	8 380 ± 990	12 130 ± 1 430
2007	Rakaia River	34 650 ± 3 850	21 460 ± 2 040	52 700 ± 4 440
2007	Rangitata River	35 960 ± 2 550	12 710 ± 1 930	33 230 ± 3 560
2007	Opihi River	18 450 ± 1 660	13 390 ± 1 660	19 160 ± 2 620
2007	Tekapo River	2 420 ± 490	4 910 ± 700	2 800 ± 430
2007	Manuherikia River	3 570 ± 840	5 630 ± 2 060	1 880 ± 640
2008	Wairau River	8 480 ± 820	8 410 ± 860	9 200 ± 1 050
2008	Ashburton River	4 170 ± 780	5 480 ± 1 130	2 960 ± 660
2008	Hokitika River	940 ± 240	1 120 ± 290	5 810 ± 970
2008	Grey River	3 390 ± 610	6 270 ± 680	3 310 ± 470
2009	Pomahaka River	6 780 ± 1 210	6 000 ± 1 440	3 630 ± 970
not present	Pelorus River	2 100 ± 380	1 600 ± 250	1 590 ± 250
not present	Waimakariri River	58 360 ± 7 100	48 950 ± 4 260	75 080 ± 6 060
not present	Taieri River	11 530 ± 1 270	19 070 ± 2 640	15 870 ± 2 970
not present	Waikaia River	6 810 ± 1 030	6 850 ± 1 190	3 540 ± 760
not present	Taramakau River	1 890 ± 390	1 720 ± 350	2 420 ± 500
not present	Arnold River	1 590 ± 430	1 420 ± 210	1 050 ± 230

from year to year. For some rivers (e.g., Motueka, Mataura), public awareness of didymo may have caused anglers to avoid these rivers despite the extent of the incursion having remained well below nuisance levels. Similar considerations may apply to the Waikaia (a tributary of the Mataura), which has remained free of didymo but lies in a catchment in which other tributary streams (e.g., Gow Burn) are known to have tested positive (Kilroy 2008). In the Southland region, for example, local FGNZ staff have noted a real decline in usage of the Mataura and Waikaia together with an increase in lake usage, possibly reflecting recent adverse publicity about river pollution in the local media.

Usage trends for the Waitaki River, where didymo is now well established, are also confounded by other factors related to the strength of the 2007/08 salmon fishery. Strong spawning runs in 2007/2008 appear to have attracted unusually large numbers of anglers to the three northern rivers, in contrast to 2001/02 when the Waitaki held the strongest runs. If so, the decline in usage of the Waitaki in 2007/08 relative to previous years may be partly an artefact of seasonal variability in the salmon fishery, and is not necessarily related to didymo. Perhaps the main conclusion to be drawn from Table 14, therefore, is that considerable local knowledge is required to interpret usage trends for each fishery, which should be left to regional FGNZ managers.

3.6. REC Interface

3.6.1. The REC

The River Environment Classification (REC) scheme, part of NIWA's Freshwater Information New Zealand (FINZ) project[7], is a GIS-based tool intended to provide resource managers with a consistent spatial context for freshwater-related monitoring, impact assessment, and policy development (Snelder & Biggs 2002). For the purposes of the present survey, its key feature is that it objectively classifies all New Zealand rivers, at a 1:50,000 mapping scale, in terms of physical variables such as flow regime, catchment geology, and land cover, and allows this information to be analysed and mapped at spatial scales ranging from regional (10^4 – 10^5 km^2) to local (~ 10 km^2).

Within the REC, the location of river channels is deduced solely from satellite-derived data on land elevation, so as to form a network of linked segments. Each of these is specified by a unique ID number that is used to allow network tracing, and to associate related information such as segment area and mean altitude. However, this does not currently include river names, so that there is no direct way to match rivers as identified by anglers (e.g., the Mataura River) with a specific subset of REC segments.

[7] See http://www.niwa.co.nz/ncwr/finz/ and http://www.niwa.co.nz/ncwr/rec for further information on FINZ and the REC, respectively.

3.6.2. Co-location algorithms

To address this problem, we extended our master database of all recognised river fisheries by adding fields defining the upstream and downstream coordinates of all named rivers, and populating these with coordinates taken from the NZMS260 1:50 000 map series. Downstream coordinates were defined either by the river mouth (for rivers flowing into the sea or a lake), or the confluence with another named river (for individual tributaries). Upstream coordinates were either a lake outlet (where appropriate), or the highest point in the headwaters (generally of order two or three) where the coalescing stream network first developed a clearly defined mainstem. We then co-located these coordinates with the centroid of the nearest REC segment, and traced downstream from the uppermost segment so as to identify and name all segments between the two endpoints. We performed these analyses on a catchment by catchment basis, working upstream from the river mouth in order of increasing tributary altitude so as to ensure that segments in streams joining an already named stream were named appropriately. This process can be added to incrementally by defining appropriate coordinates for each named river as the need arises, and has currently associated river names with 45 775 (7.9%) of the 576 276 REC segments, representing 896 rivers and including 72.0% of segments for streams of order five or higher (Table 15). Given that few waterways of order one or two are likely to be named, this appears to be an efficient, practical, and robust way of associating river names with the REC.

Table 15: Proportion of named REC reaches by stream order, representing all significant river fisheries in New Zealand.

	All REC reaches		Names reaches	
Order	Number	Total length (km)	Number (% of total)	Length (% of total)
1	294 528	225 890	99 (0.0%)	117 (0.1%)
2	134 371	100 479	1 386 (1.0%)	1 140 (1.1%)
3	74 042	51 308	6 408 (8.7%)	4 082 (8.0%)
4	39 325	26 148	13 378 (34.0%)	8 380 (32.0%)
5	19 001	12 584	12 445 (65.5%)	8 286 (65.8%)
6	10 510	6 241	7 923 (75.4%)	5 455 (87.4%)
7	3 833	2 437	3 501 (91.3%)	2 285 (93.8%)
8	666	382	635 (95.3%)	349 (91.3%)
Total	576 276	425 469	45 775 (7.9%)	30 094 (7.1%)

Lakes and reservoirs are not specifically included in the REC, but are available as uniquely numbered shape polygons in a format that can readily be overlaid onto the

REC. For the purposes of the present report we co-located all known lake fisheries in the angler survey database with the master record of shape polygons (containing 54 724 entries). This allowed us to estimate total area and perimeter for each lake fishery, and – together with the REC segment data – total length for each river fishery. We then used these data to estimate total annual angling effort per km of river, lake perimeter in km, and lake area in km^2, so as yield comparable and consistent estimates of angling pressure for each water type. We also examined the extent to which usage per linear km varied between lake and river fisheries (expressed as perimeter length or total segment length, respectively), to determine whether these two measures could be combined to yield a single measure of angling density common to both lakes and rivers.

3.6.3. Current status

As of January 2009, 897 (96.6%) of the 929 named river fisheries in the survey database had been successfully linked to the REC. The main exceptions were canals (such as those in the upper Waitaki catchment, which do not conform to the REC's underlying topographic assumptions), and streams draining areas such as Mount Taranaki where the spatial separation between the headwaters of two physical separated catchments was sometimes less than the scale (median 520 m) of the nearest REC segment. Other potential sources of error include tributary streams flowing into lakes, where the downstream endpoint of the stream does not necessarily match the REC representation of the corresponding mainstem as it traverses the lake bed, and a few long-standing errors in the main REC database itself. All but one of the 248 recognised lake fisheries have been mapped to their nearest lake polygon, although some manual checking remains to be done for the smallest lakes (< 1 ha) to ensure that lakes in close physical proximity to others have been correctly mapped. These tasks are ongoing and it is beyond the scope of this study to resolve all such errors, but we are confident that the data currently to hand are more than adequate to demonstrate the potential of the REC for analysing and visualising the survey data.

3.6.4. Applications

In the following section we give some examples of how the REC can be applied to the survey data. These are illustrative only, and are primarily intended to stimulate further discussion within FGNZ regarding priorities for future analysis. They should also be regarded as provisional until a definitive match between individual REC segments and named angling waters has been achieved.

Data visualisation: The REC's mapping tools offer many possibilities for summarising the survey data in a highly visual graphical format. Attributes such as line thickness, line colour, line style, and shading can readily be used to represent fishery attributes such as total effort, effort per km, angler origin, and changes in effort over time, at various levels of spatial resolution (e.g., individual waters, sub-catchments defined by stream order, FGNZ regions). For example, using line or lake polygon colour to represent total annual usage clearly shows how angling effort is distributed among the twelve FGNZ regions (Figure 2), and using colour to represent the proportion of total effort contributed by overseas visitors to New Zealand vividly illustrates their preference for rivers rather than lakes, and for South Island inland waters rather than coastal and lowland rivers (Figure 3).

Relating angler activity to catchment and reach variables: The ability to identify all river fisheries with a specific subset of REC reaches makes it possible to characterise each river, or combinations of rivers, in terms of REC attributes such as stream order[8], mean flow, altitude, etc. For the purposes of this report all such calculations implicitly assume that angling activity on any one river is evenly distributed along the length of interest to anglers (as identified by regional FGNZ staff), but further refinement of the database would allow longitudinal variation in angling effort to be modelled more realistically. For example, models allowing effort per km to decrease linearly or exponentially with increasing distance upstream would be appropriate for many back country and headwater fisheries, while the reverse may be appropriate for lake-fed or lowland rivers.

At the time of writing, matches between usage estimates and REC reaches were available for 534 rivers ≥ 2 km long. Comparison of mean attributes by water type (Table 16) confirms that the existing classification scheme successfully captures the basic features of each water type with respect to basic descriptors such as mean flow and altitude, and suggests that further opportunities for characterising individual fisheries are likely to become available as further reach and catchment scale variables (e.g., land use, geology) are incorporated.

[8] The REC characterises rivers as a network of interconnected segments (or reaches) and nodes, with a node defined as the point of confluence between two segments. Stream order is an index of network complexity (and hence size), and is defined as follows. The uppermost reach in any network (i.e., the reach draining the smallest sub-catchment which can be considered physically meaningful) is defined as order 1. Whenever two segments converge, the order either increases by one (if each inflowing segment has the same order), or remains the same as the higher order segment (if the two differ). In New Zealand of the two s , . Stream order is an index of the size of each individual reach in a river network, where a reach can be thought of as an individual

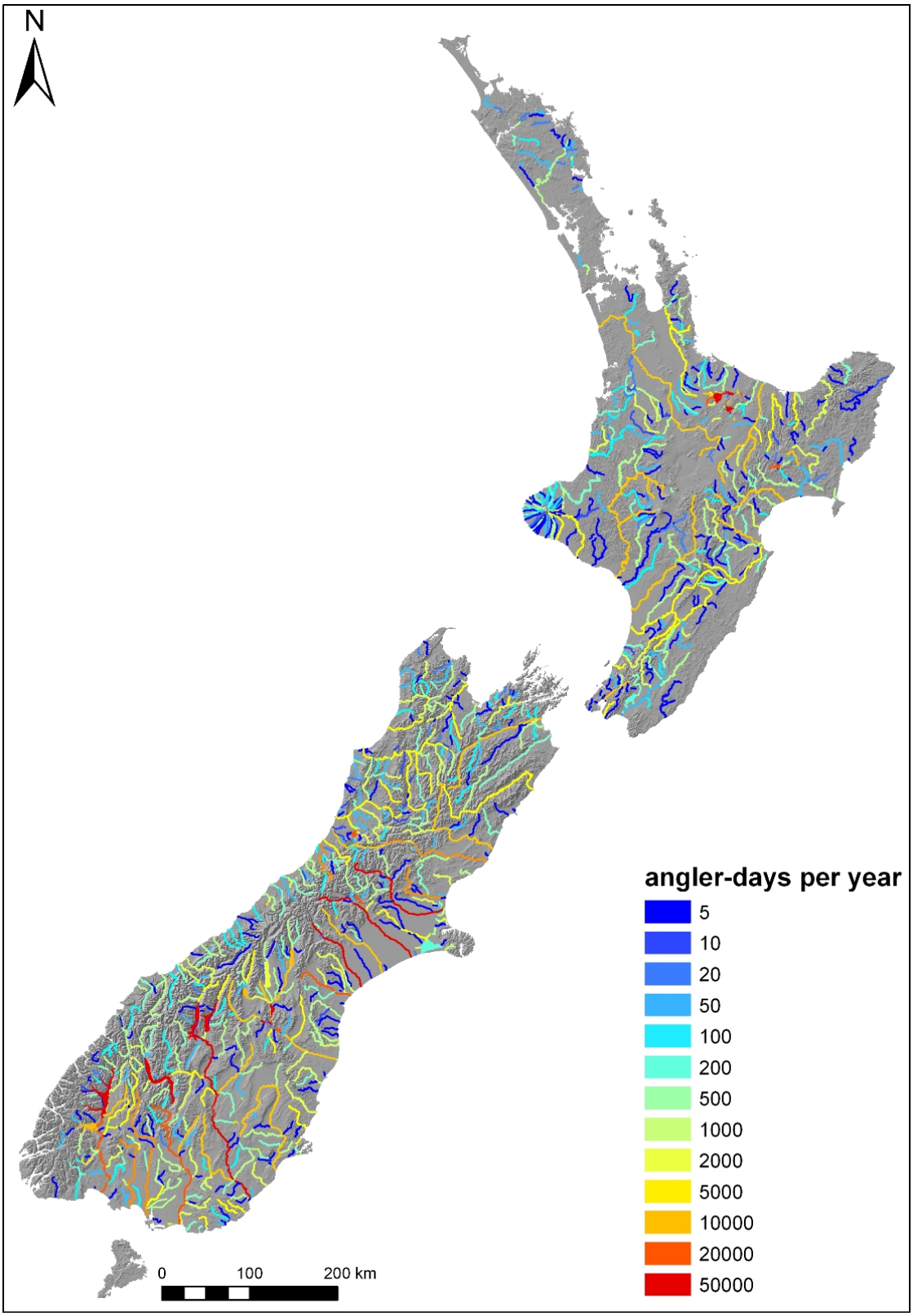

Figure 2: **Estimated angler usage of New Zealand lakes and rivers in 2007/08, with rivers and lake polygons coloured according to log transformed usage. This representation of the data clearly identifies the most heavily used waters, but takes no account of river length or lake area and thus does not reliably indicate angler density.**

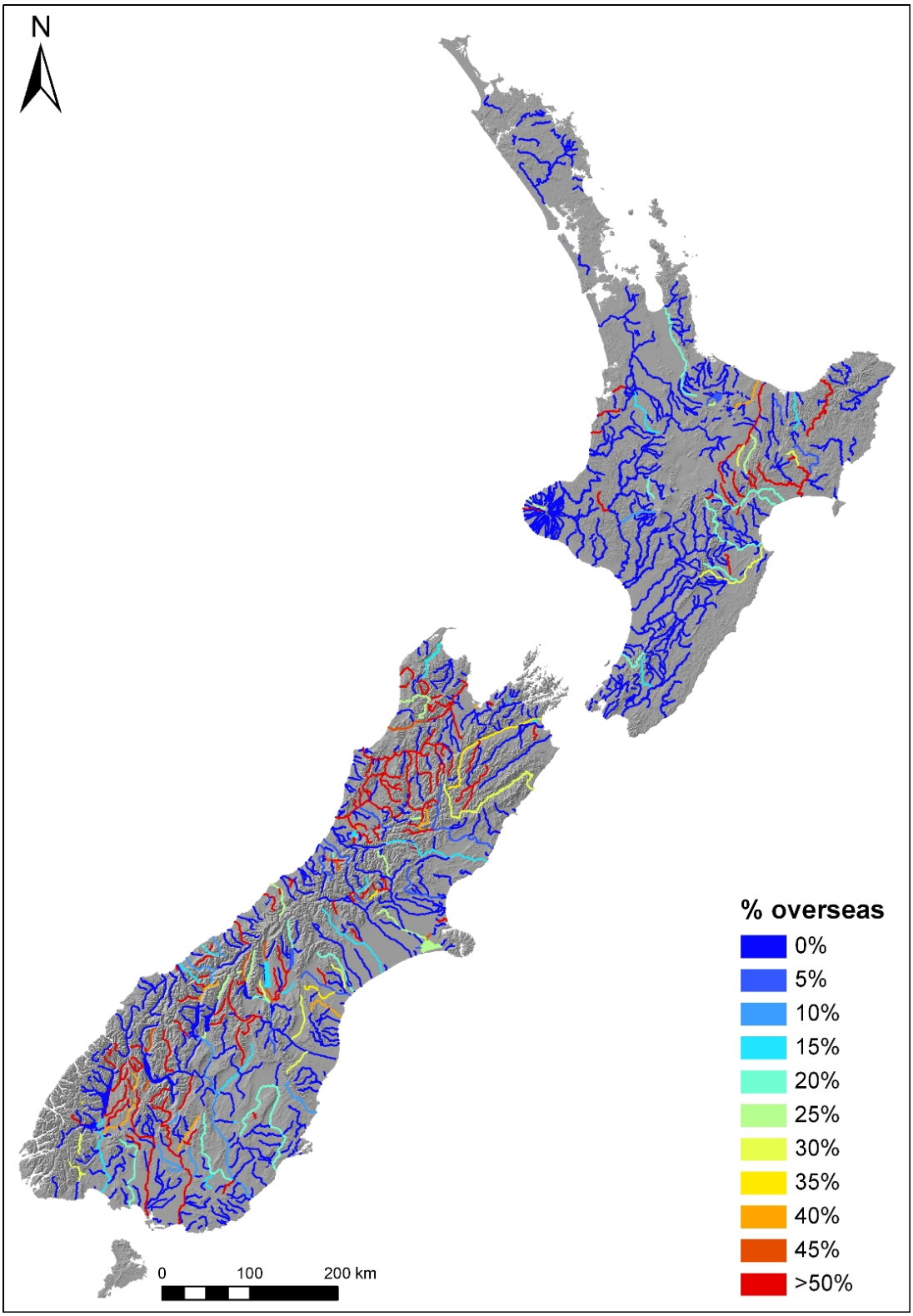

Figure 3: **Estimated usage of New Zealand lakes and rivers by overseas visitors in 2007/08, with rivers and lake polygons coloured according to the percentage of total usage contributed by overseas licence holders. This representation of the data gives no indication of actual usage, so that waters of similar colour may vary markedly in terms of total annual effort.**

Table 16: Total length, and mean stream order, altitude, and distance from sea for four types of river fishery

Type of river	Total length (km)	Order	Altitude (m)	Distance from sea (km)
Mainstem river	3006	6.36	194	99
Lowland river	6210	4.88	129	78
Back country	5050	5.02	291	105
Headwater	2947	4.84	352	157

Angler density: Estimates of angler usage can be combined with data on the fishable length of each river to yield a variety of indices for comparing usage among rivers. One such index is km per angler-day, calculated as the total fishable length in km divided by the mean number of anglers per day over the whole river. For example, estimated usage of the Mataura River in 2007/08 was 40 260 angler-days, or 110.3 anglers per day assuming a 365 day angling season[9]. Regional FGNZ staff consider the Mataura to be fishable downstream of NZMS260: 2158530, 5529450, about 6 km above the road head at the confluence with Robert Creek, from which the REC gives a total fishable length of 229 km. Assuming anglers are evenly distributed along the river, there are thus 0.48 (110/229) anglers per km of river on an average day. Inverting this figure so as to give km per angler, and thus avoid needing to think in fractions of an angler per km, the Mataura sustains an average density of 2.08 (229 / 110) km per angler on any one day. This can readily be visualised as the length of river each angler would have to themselves if their efforts were uniformly distributed throughout the angling season, and along the river, so that low indices correspond to a high density of anglers. By comparison, equivalent figures for other representative river fisheries are Ahuriri River: 6.1 km per angler-day; Karamea River: 32.9 km per angler-day; Arthur River: 93 km per angler-day.

The above index, which can be though of as the *Mean free reach* (or MFR, to borrow a concept widely used in physics[10]), provides a natural measure of angling pressure. A comparison of angling densities over all river fisheries at least 2 km long indicates that the MFR rarely falls below 1 km, and that figures of 10-100 km are typical (Figures 4, 5). These results also suggest that MFR varies remarkably little among water types, with similar distributions and medians (40-50 km) for lowland, back country, and headwater fisheries.

[9] A more thorough calculation would take into account variation in the angling season between and within regions. For example, many back country and headwater fisheries are closed from May to September inclusive, and are thus open for only 212 out of 365 days.

[10] In the kinetic theory of gases, as in nuclear physics, the mean free path is the mean distance a particle (e.g., a gas molecule) moves before it collides with another particle. The higher the pressure, the shorter the mean free path. In the context of angling pressure, the MFR is the mean length of reach within which an angler can move up or down river before encountering another angler. Thus, high angling pressure corresponds to a low MFR, and vice versa.

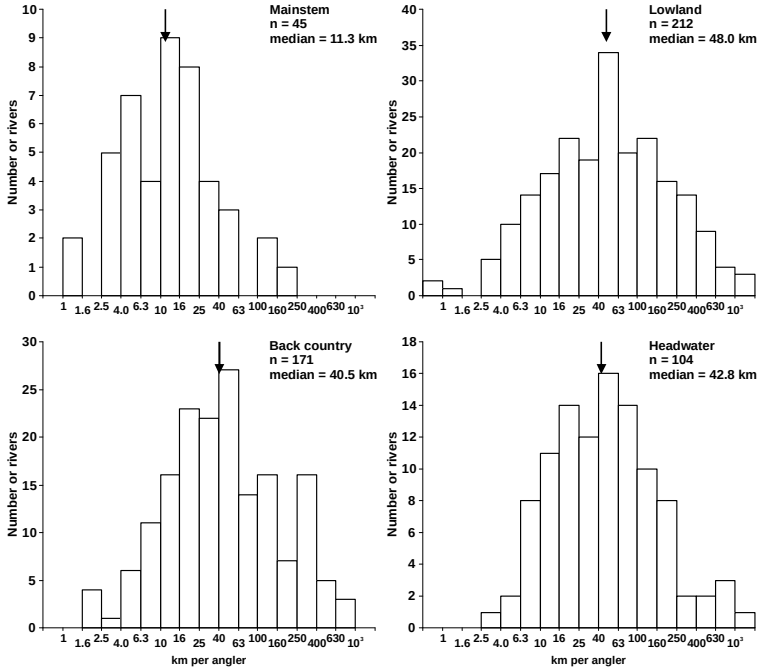

Figure 4: **Estimated angling density (indexed as km per angler per day) for 532 river fisheries for which an estimate of total fishable length is currently available, grouped by water type. The left- and right-most bins denote indices of < 1 km per angler per day, and > 1000 km per angler per day, respectively.**

The above estimates ignore the presence of seasonal closures (e.g., many river fisheries are closed from May to September inclusive), although this information could easily be added to the survey database by referring to the appropriate FGNZ regulations.. Another challenge is to develop a similar measure for lake fisheries, based on lake perimeter, lake area, or some combination of the two, which also has the dimensions of a linear distance per angler and can thus be compared directly between lakes and rivers.

4. Discussion

4.1. Data quality

The 2007/08 survey was the most complete of the three surveys conducted to date with respect to coverage of the licenced angling population. All New Zealand resident anglers who provided a viable telephone contact number were included in the sampling frame, as were all adult overseas residents who provided an email address. Email proved to be an effective way of contacting overseas resident whole-season licence holders, but was less effective for part-season licence holders. Several factors related to the licence database used for the survey contributed to this problem, not all

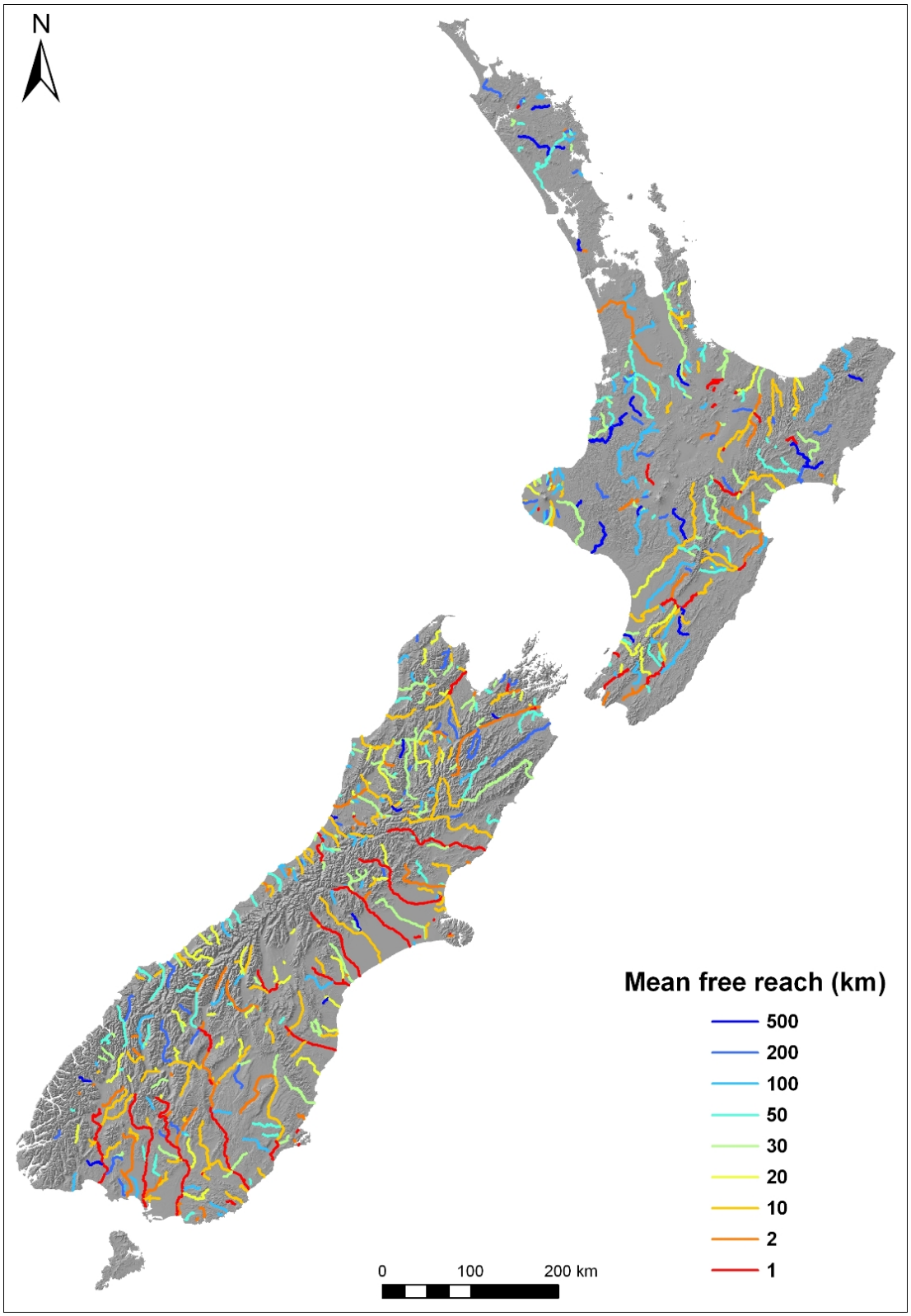

Figure 5: **Angling pressure on New Zealand river fisheries as indexed by mean free reach (MFR; see text for details). Low values of MFR, denoted by red and orange colours, correspond to the highest angling pressure.**

of which were resolvable. These included records which were unclear as to whether or not the holder was actually a New Zealand resident, 779 of which (including 549 part-season licences) were discarded from the sampling frame; records where the address appeared to reflect the fishing guide or lodge from whom the licence was bought rather than the angler origin; records where the country of residence was given as New Zealand but the remainder of the address (e.g., Pretoria) clearly indicated an overseas visitor; and records with incomplete or missing records for key fields such as country of origin and email. These fields are indicated on the online application form[11] as mandatory, but were absent from over three-quarters of the 2007/08 records. Resolving this problem, e.g., by implementing an automated email verification check, would greatly increase the number of overseas licence holders available to the sampling frame.

The other main data quality issue is confusion over river and lake names which are either duplicated, or close enough in spelling to be easily confused. In the latter case most such problems are easily recognised, and are detected at an early stage during data analysis. For example, two Southland licence holders, both residents of Invercargill, were recorded on the raw data forms as having fished Lake Manuwai, a small (126 km^2) reservoir 10 km northwest of Kerikeri in the Bay of Islands. This lake was fished by eight Northland residents, all but one of whom lived in Kerikeri, but was not fished by any other New Zealand resident other than the two Invercargill anglers mentioned above. It is clear that the original records were in error, and that the lake should have been recorded as Lake Monowai in southern Fiordland, which was fished by 76 respondents of whom all but two lived in Otago or Southland. Errors associated with duplicate river names are more difficult to detect, and it is virtually certain that some such errors remain in the database. Confusion between well-known rivers (e.g., the Waiau River in North Canterbury vs. the Waiau River in Southland) can often be resolved by taking note of where the respondent lived and which other waters they fished, but many other such cases remain ambiguous. For example, the upper Buller catchment includes two fishable tributaries with the name of Station Creek, the names Poerua River, Fox River, and Totara River are all duplicated within the West Coast Region, the Mangaone River, Mangatainoka River, Mangatutu Stream, and Mangawhero Stream are all duplicated in the central North Island, and at least four upper North Island rivers bear the name Wairoa River. It is unreasonable to expect non FGNZ staff to be familiar with all such duplications, and an appropriate strategy for dealing with these and other fishing location issues (e.g., interpreting local names) may be for regional FGNZ staff to screen all responses before they are entered into the database, and to seek further clarification via telephone or email as necessary.

[11] https://fishandgame.eyede.com/public/get_page.php?page_id=customer

As with the 2001/02 survey, dividing some larger rivers into reaches was generally successful in gathering usage information at a finer level of detail. Remarkably, many overseas respondents provided this information even though they were not specifically prompted to do so. For some rivers (e.g., the Oreti, Taieri, and Hurunui) this information is potentially of great value to FGNZ managers seeking to promote the fishery values of individual river sections rather than the river as a whole.

The lack of concurrent data for the Taupo Conservancy has no direct effect on usage estimates for the fisheries managed by FGNZ, but precludes estimating total usage for all angling for acclimatised fish in New Zealand. This situation has yet to be resolved.

4.2. Accuracy and precision

When reporting on the 2001/02 survey we noted the desirability of FGNZ initiating some form of cross-validation to test the underlying assumptions that non-response and recall bias can be ignored, and hence to validate the survey methodology. Designing and implementing such a programme would be a considerable challenge, and it is perhaps no surprise that little progress towards this goal has been made.

Perhaps the most tractable approach to this problem is for regional FGNZ staff designing and conducting surveys targeting specific waters within their region to be alert to the possibility of structuring these surveys so that meaningful comparisons can be made with the results of the national survey. For example, it is encouraging to note that the 2007/08 results for the upper Oreti River, showing that overseas visitors accounted for 27% of total usage, is broadly consistent with the results of a 2000/2001 creel survey showing that overseas visitors accounted for 22% of encounters with Southland licence holders, and 53% encounters with licence holders from all New Zealand regions combined (Sutherland 2001). It is also worth noting that the ~65 000 angler-days contributed by overseas visitors in 2007/08 is very close to the estimated figure of 61 000 angler-days in 2001/02, which was derived solely on the basis of the number of licences sold to overseas residents rather than any specific information on which waters they fished.

4.3. Further analyses

With completion of the third national survey since 1994/95, FGNZ has now built up a substantial database of changes in angler activity over a timescale of 13-14 years. This dataset is rich in possibilities for further analyses, both at the national level (focussing on long term trends and large-scale geographic patterns), and at regional and local levels (focussing on specific catchments and individual waters). Much of this analysis should most appropriately be conducted by regional FGNZ staff, who are intimately

familiar with their respective fisheries and in the best position to interpret the results. It is therefore important that FGNZ staff have the opportunity to become more familiar with the database and acquire data-processing skills commensurate with their own needs, so that these opportunities can be fully exploited. A workshop or training session would be an appropriate way of achieving this.

By far the richest source of potential future analyses, however, is the ability to link the survey data to the REC. At the time of writing this ability has already been noted by various third-party agencies, resulting in two formal approaches to FGNZ for permission to use aspects of the data. Of particular interest is a collaborative project, led by Lincoln University but also involving FGNZ, to develop a formal protocol for identifying and ranking the significance of rivers with respect to a range of attributes including industry, recreation, and cultural values (Booth et al. 2009). Although angling is only one such activity, the data sets available through FGNZ's surveys will allow the template to be thoroughly tested and refined using real data, and thus to be fully validated before being applied to other, less data-rich activities such as whitewater kayaking and swimming, and to developmental uses such as irrigation and hydroelectric generation. A second project drawing extensively on the 2007/08 results currently being undertaken on behalf of the Department of Conservation, is a study of possible vectors influencing the spread of *Didymosphenia geminata* around the South Island, and potential pathways for it to reach the North Island.

4.4. Recommendations for future surveys

Assuming that FGNZ continues to conduct national surveys every 6-7 years, the next such survey will occur in 2013/2014. It is reasonable to assume that web and internet based technology will continue to develop rapidly over the intervening years, and will continue to offer new and possibly highly cost effective opportunities for data collection. For example, the REC interface could be developed to provide an interactive map of all known lake and river fisheries, and hence to further improve data quality by minimising confusion over river names and facilitating online data capture. It is also reasonable to anticipate further improvements to the centralised Eyede database, so that any ambiguity with regard to country of residence is minimised, and all email addresses are cross-validated.

As noted in Section 4.2, opportunities for cross-validating the national survey during local and regional FGNZ surveys should be taken whenever it is feasible to do so. Creel survey data such as angler origin, angler density, and licence type all have the potential to generate data sets which can be compared with results from the national survey, and FGNZ is encouraged to explore ways of consolidating such data into a centralised database.

5. Acknowledgements

I thank Maurice Rodway (FGNZ, Southland) for coordinating the survey and project management; regional FGNZ staff (particularly Cheryl Mason, Jilli Steedman, and Fay Stodart) and John Newman (Eyede Ltd.) for providing prompt and timely records of licence sales; Pamela Parker, Amanda Watt, Gemma Graeve, and staff at the Southland Institute of Technology for the more than 17 000 successful telephone calls which provided the survey data. Julian Sykes and John Carter provided GIS support, and Maurice Rodway, Neil Deans and Eric Graynoth provided feedback on an earlier draft of this report. Finally, thanks are extended to the 14 600 anglers (some of whom were interviewed as many as five times) whose responses made the survey possible.

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Appendix 1: **Estimated usage (angler-days ± 1 standard error) for all New Zealand lake and river fisheries recorded in either the 1994/96 or 2001/02 National Angling Surveys, grouped by fishing Region and catchment. Catchments are ordered clockwise around New Zealand (Anon. 1956); catchment sub-totals are given for all catchments containing five or more recognised fisheries. Blank cells indicate that no effort was recorded by respondents over the given period.**

Northland Region

		2007/2008								
Catchment	**River (reach) / Lake**	**Oct-Nov**	**Dec-Jan**	**Feb-Mar**	**Apr-May**	**Jun-Jul**	**Aug-Sep**	**Total**	**2001/2002 total**	**1994/1995 total**
Awanui River	Awanui River	30 ± 30						30 ± 30		
	Victoria River		20 ± 20					20 ± 20	30 ± 20	
Rangitane River	Lake Manuwai	80 ± 70	270 ± 140	100 ± 100	< 10			460 ± 190	170 ± 40	
	Rangitane River	30 ± 30						30 ± 30		
	Waipapa Stream				30 ± 30			30 ± 30		
Kerikeri River	Kerikeri River								20 ± 10	
Waitangi River	Waitangi River			20 ± 10				20 ± 10	120 ± 10	
Kawakawa River	Tirohanga Stream								< 10	
Hatea River	Hatea River	80 ± 80						80 ± 80		
	Mangakino Stream	10 ± 10	170 ± 110		50 ± 30	20 ± 20		240 ± 120	< 10	
	Whau Valley Dam	90 ± 40	90 ± 70	30 ± 30	30 ± 20	250 ± 250		480 ± 260	100 ± 40	
Ruakaka River	Wilsons Dam		20 ± 20			50 ± 50		70 ± 50		
Waipu River	North River			10 ± 10				10 ± 10		
	Waipu River		10 ± 10	10 ± 10				20 ± 20		
Wairoa River	Kaiikanui River	40 ± 40	10 ± 10					50 ± 40	< 10	
	Kaimamaku Stream								< 10	

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Mangahahuru Stream		40 ± 40		< 10			40 ± 40	10 ± 10	
	Mangakahia River	20 ± 20			20 ± 20			40 ± 30	100 ± 100	
	Mangatu Stream					50 ± 50		50 ± 50	< 10	
	Mangere Stream		10 ± 10					10 ± 10		
	Poroti Stream		10 ± 10					10 ± 10		
	Waiariki River			170 ± 170				170 ± 170		
	Waiotu Stream								20 ± 10	
	Wairoa River	130 ± 70	80 ± 50	270 ± 160	10 ± 10			500 ± 180	110 ± 50	
	Kirikiritoki Stream				10 ± 10			10 ± 10		
	Whakapara River	20 ± 20						20 ± 20	50 ± 30	
	Te Waiongatahuna Stream		20 ± 20					20 ± 20		
Total, Wairoa catchment		210 ± 80	160 ± 70	440 ± 230	50 ± 30	50 ± 50		910 ± 260	300 ± 110	
Kaiiwi Lakes	Kaiiwi Lakes	50 ± 40	110 ± 90	30 ± 30		450 ± 240	10 ± 10	650 ± 260	1070 ± 500	340 ± 130
	Lake Taharoa		40 ± 40	20 ± 20			30 ± 30	80 ± 50	10 ± 10	
Waima River	Punakitere River		50 ± 50					50 ± 50		
	Waima River			130 ± 110				130 ± 110		
Waihou River	Pukatea Stream		20 ± 20					20 ± 20		
	Waihou River		90 ± 50	60 ± 40	70 ± 70	110 ± 80		320 ± 130	30 ± 30	
	Waipapa River			10 ± 10				10 ± 10	30 ± 20	
Total, all waters		**560 ± 150**	**1040 ± 240**	**860 ± 280**	**240 ± 90**	**920 ± 360**	**40 ± 30**	**3650 ± 550**	**1870 ± 520**	**340 ± 130**

Auckland/Waikato Region

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
Henderson Lake	Henderson Lake								50 ± 50	
Waitemata Harbour	Carter Holt Ponds								30 ± 30	
	Chelsea Sugar Works Pond	< 10						< 10	110 ± 60	600 ± 210
	Lake Pupuke	270 ± 100	10 ± 10	110 ± 50	50 ± 50	360 ± 260	130 ± 130	920 ± 310	610 ± 340	1240 ± 340
Wairoa River	Wairoa River								50 ± 30	
Kape-o-kati Coast	Kaiaua Gravel Pits					50 ± 50		50 ± 50	200 ± 70	450 ± 140
Waihou River	Hikutaia River									20 ± 20
	Kakahu Stream	50 ± 50		< 10	20 ± 20			80 ± 50	250 ± 100	30 ± 20
	Komata River			30 ± 30				30 ± 30		20 ± 20
	Maratoto Stream	< 10						< 10		
	Ohinemuri River	470 ± 120	260 ± 100	570 ± 230	130 ± 120	50 ± 50	50 ± 40	1530 ± 310	2600 ± 480	1620 ± 390
	Oraka Stream			20 ± 20				20 ± 20	100 ± 70	130 ± 50
	Purere Stream								30 ± 30	
	Rapurapu Stream				20 ± 20			20 ± 20	150 ± 80	130 ± 100
	Waihou River	340 ± 140	190 ± 70	380 ± 170		370 ± 370	250 ± 140	1530 ± 460	2640 ± 370	1780 ± 320
	Waimakariri Stream	160 ± 100	70 ± 50	40 ± 20		100 ± 80		370 ± 140	770 ± 190	550 ± 130
	Waiomou Stream								500 ± 150	490 ± 140
	Waitawheta River		250 ± 130	100 ± 50		50 ± 50	90 ± 90	480 ± 180	650 ± 190	160 ± 50
	Waitekauri River		80 ± 80	10 ± 10				90 ± 80	190 ± 70	300 ± 200
Total, Waihou catchment		1020 ± 210	850 ± 200	1150 ± 290	180 ± 130	570 ± 390	390 ± 170	4160 ± 610	7860 ± 700	5240 ± 590
Kauaeranga River	Kauaeranga River	110 ± 90	< 10	30 ± 30	10 ± 10			150 ± 100	130 ± 110	140 ± 50
Waiwawa River	Waiwawa River								60 ± 40	1050 ± 410
Tairua River	Tairua River	20 ± 10	100 ± 40	40 ± 40	170 ± 150	100 ± 100	30 ± 30	440 ± 190	60 ± 50	320 ± 100
Waihi Estuary	Waihi Estuary			< 10				< 10		

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
Whanganui River	Mangatepopo Stream									20 ± 10
	Ohura River		110 ± 70			110 ± 110		220 ± 130	30 ± 30	50 ± 50
	Ongarue River	120 ± 80	70 ± 60	20 ± 20				210 ± 100	290 ± 100	690 ± 370
	Piopiotea Stream		< 10		< 10			20 ± 10	< 10	
	Taringamotu River			30 ± 30				30 ± 30	50 ± 50	20 ± 20
	Waimiha Stream	10 ± 10		50 ± 50				60 ± 50	90 ± 60	220 ± 140
	Waione Stream									40 ± 30
	Whakapapa River	390 ± 120	840 ± 210	800 ± 200	590 ± 280		220 ± 120	2840 ± 440	1030 ± 310	330 ± 90
Whanganui River (above Ohura confluence)		320 ± 110	450 ± 200	130 ± 70	< 10			910 ± 240	1260 ± 360	
Whanganui River (below Ohura confluence)									190 ± 80	
Whanganui River Total		320 ± 110	450 ± 200	130 ± 70	< 10			910 ± 240	1450 ± 360	NA
Total, Whanganui catchment		840 ± 180	1480 ± 300	1030 ± 220	600 ± 280	110 ± 110	220 ± 120	4270 ± 530	2950 ± 490	3150 ± 660
Mokau River			< 10	50 ± 40	100 ± 80			150 ± 90	70 ± 40	190 ± 70
	Mangapehi Stream	30 ± 30						30 ± 30	50 ± 50	
	Mokau River		20 ± 10	40 ± 40				60 ± 40	170 ± 80	280 ± 170
Marokopa River	Mangaohae Stream		40 ± 30					40 ± 30	180 ± 70	300 ± 90
	Marokopa River	10 ± 10		10 ± 10			80 ± 80	110 ± 80	100 ± 40	150 ± 50
	Tawarau River		< 10	80 ± 60				90 ± 60	230 ± 120	30 ± 20
Awaroa River	Awaroa River			40 ± 40				40 ± 40		
Oparau River	Oparau River			80 ± 80				80 ± 80		
Waikato River	Hamilton Lake								70 ± 30	440 ± 180
	Kaiwhitiwhiti Stream								80 ± 80	
	Kaniwhaniwha Stream	30 ± 20	20 ± 20	60 ± 60				110 ± 70	370 ± 140	860 ± 220
	Lake Arapuni	270 ± 90	1470 ± 680	1900 ± 770	1620 ± 1450	360 ± 210	380 ± 250	5990 ± 1810	9730 ± 980	7300 ± 900
	Lake D	50 ± 50	10 ± 10					60 ± 50		
	Lake Hakanoa	30 ± 20		30 ± 20	20 ± 20	30 ± 30	80 ± 80	180 ± 90	30 ± 30	150 ± 60

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Lake Karapiro	70 ± 40	270 ± 100	300 ± 210	130 ± 90	50 ± 50	340 ± 220	1160 ± 340	2320 ± 450	4810 ± 680
	Lake Moananui		60 ± 40	110 ± 90	120 ± 100			300 ± 140	330 ± 270	
	Lake Ngaroto			20 ± 20				20 ± 20		
	Lake Otamatearoa								40 ± 20	
	Lake Waipapa		70 ± 70	250 ± 180	20 ± 20		200 ± 200	540 ± 280	1370 ± 410	830 ± 450
	Lake Whatihua								110 ± 50	90 ± 40
	Little Waipa Stream	< 10	30 ± 30	60 ± 40				100 ± 50	170 ± 90	730 ± 210
	Mangaokewa Stream				< 10			< 10	20 ± 20	40 ± 20
	Mangaorongo Stream	20 ± 20						20 ± 20		280 ± 270
	Mangatangi Reservoir					30 ± 30	30 ± 30	50 ± 40	140 ± 90	840 ± 150
	Mangatawhiri Reservoir			10 ± 10			30 ± 30	40 ± 30	300 ± 120	
	Mangatawhiri River	70 ± 70						70 ± 70	20 ± 20	
	Mangatutu Stream	260 ± 110	160 ± 80	170 ± 80	170 ± 90	100 ± 100		860 ± 200	1070 ± 230	1600 ± 350
	Mangauika Stream		10 ± 10					10 ± 10	150 ± 140	
	Mangawara Stream	80 ± 50	40 ± 40	10 ± 10				130 ± 60	90 ± 30	10 ± 10
	Mangawawa Stream	220 ± 220						220 ± 220	< 10	
	Mangawhero Stream	20 ± 20		20 ± 20				40 ± 30	50 ± 50	90 ± 70
	Mangawhio Stream		10 ± 10					10 ± 10	70 ± 50	
	Matarawa Stream			< 10				< 10	610 ± 610	
	Moakurarua Stream	40 ± 30	50 ± 30					90 ± 40	150 ± 50	320 ± 200
	Ngakoaohia Stream	< 10		10 ± 10	20 ± 20	70 ± 70		120 ± 80	430 ± 140	270 ± 100
	Ngutunui Stream			10 ± 10				10 ± 10	40 ± 30	80 ± 40
	Parkinsons Lake	< 10			30 ± 20			40 ± 20	40 ± 30	20 ± 20
	Pokaiwhenua Stream		50 ± 40	70 ± 40				120 ± 60	230 ± 80	360 ± 110
	Puniu River	30 ± 20	110 ± 60	300 ± 270				440 ± 280	840 ± 180	1220 ± 270
	Rangiriri Stream	50 ± 30	40 ± 40	140 ± 90		30 ± 30		260 ± 110	260 ± 110	

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
Waikato River (reach unspecified)		40 ± 40	760 ± 380	30 ± 30	20 ± 20	150 ± 150	280 ± 280	1280 ± 500	470 ± 150	3710 ± 1570
Waikato River (below Karapiro)		470 ± 180	500 ± 140	1060 ± 330	450 ± 210	1170 ± 710	1310 ± 500	4950 ± 980	4360 ± 780	7250 ± 790
Waikato River Total		500 ± 180	1260 ± 410	1090 ± 330	470 ± 210	1320 ± 720	1590 ± 570	6230 ± 1100	4830 ± 800	10950 ± 1760
	Waipa River	60 ± 30	520 ± 200	120 ± 100	100 ± 60		80 ± 80	880 ± 250	1560 ± 400	2600 ± 680
	Waipapa River		110 ± 80			150 ± 110	180 ± 100	440 ± 170	220 ± 80	440 ± 110
	Waipari River								70 ± 40	50 ± 40
	Whakauru Stream			80 ± 90				80 ± 90		
	Whangamarino River				40 ± 30			40 ± 30	70 ± 60	80 ± 30
	Lake Waikare					100 ± 100		100 ± 100		
Total, Waikato catchment		1810 ± 340	4310 ± 840	4770 ± 950	2760 ± 1480	2220 ± 780	2900 ± 710	18760 ± 2240	25860 ± 1670	34450 ± 2350
Pahurehure Inlet	Bombay Pond			30 ± 30	20 ± 20			50 ± 40	220 ± 150	460 ± 160
Lake Kereta	Lake Kereta									130 ± 60
Lake Ototoa	Lake Ototoa	40 ± 30	20 ± 20	30 ± 20	70 ± 50	30 ± 30	30 ± 30	210 ± 80	1260 ± 320	930 ± 270
Muriwai Beach	Lake Okaihau						80 ± 80	80 ± 80	110 ± 100	320 ± 90
	Muriwai Beach								< 10	
Kaipara River	Kaipara River	20 ± 20						20 ± 20		
	Kumeu/Kaipara River				340 ± 340			340 ± 340		20 ± 20
Lake Tomarata	Lake Tomarata			10 ± 10			30 ± 30	40 ± 30	40 ± 20	180 ± 160
Awakino River	Awakino River	130 ± 40	240 ± 80	200 ± 80	30 ± 30			600 ± 120	840 ± 360	800 ± 150
Waikawau River	Waikawau River			30 ± 30				30 ± 30		
Total, all waters		**4290 ± 470**	**7080 ± 920**	**7730 ± 1030**	**4330 ± 1560**	**3430 ± 920**	**3860 ± 760**	**30720 ± 2450**	**41230 ± 1990**	**50430 ± 2620**

Eastern Region

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
Tuapiro Creek	Tuapiro Creek		40 ± 40					40 ± 40	40 ± 30	
	Waitengaue Stream		90 ± 90					90 ± 90		
Wairoa River	McLaren Falls Dam	320 ± 170	120 ± 60	240 ± 150			190 ± 190	860 ± 300	1200 ± 420	1700 ± 630
	Ngamuwahine River								1000 ± 440	160 ± 100
	Ngatuhoa Stream		10 ± 10	200 ± 170			80 ± 80	290 ± 190		
	Ohourere Stream		20 ± 20					20 ± 20	50 ± 40	
	Omanawa River			80 ± 80				80 ± 80	70 ± 70	
	Opuiaki River								20 ± 20	
	Ruahihi Canal	70 ± 70	190 ± 170				120 ± 120	380 ± 220	460 ± 350	1070 ± 420
	Wairoa River	30 ± 20	40 ± 40	10 ± 10				80 ± 40	160 ± 80	140 ± 110
Total, Wairoa catchment		420 ± 180	360 ± 190	530 ± 240			380 ± 230	1700 ± 430	2960 ± 710	3070 ± 770
Waimapu Stream	Waimapu Stream								50 ± 50	
Kaituna River	Awahou Stream	20 ± 20	230 ± 130	720 ± 360	170 ± 130		270 ± 160	1410 ± 430	1420 ± 580	190 ± 130
	Hamurana Stream	70 ± 70	210 ± 140	200 ± 130	210 ± 210		190 ± 120	880 ± 310	1550 ± 810	1070 ± 580
	Kaituna River		50 ± 40	160 ± 110		160 ± 120	50 ± 50	410 ± 170	1560 ± 760	2460 ± 650
	Lake Rotoiti	6810 ± 1180	17610 ± 2140	9220 ± 1140	10830 ± 2380	2320 ± 700	1280 ± 620	48070 ± 3710	40540 ± 2840	43370 ± 3430
	Lake Rotorua	3400 ± 990	8810 ± 1400	7200 ± 1040	6200 ± 2020	2880 ± 1040	3520 ± 1040	32000 ± 3200	27510 ± 2110	40190 ± 4400
	Ngongotaha Stream	420 ± 240	2750 ± 930	1760 ± 420	2070 ± 590	2340 ± 1050	1910 ± 970	11240 ± 1870	11240 ± 1990	8800 ± 2680
	Ohau Channel	100 ± 70	200 ± 100	530 ± 350	690 ± 300	360 ± 360	4410 ± 3730	6290 ± 3780	2180 ± 1050	4720 ± 1050
	Utuhina Stream	270 ± 270	90 ± 50	40 ± 40		40 ± 40	120 ± 90	560 ± 300	3060 ± 1130	2310 ± 1440
	Waiari Stream								40 ± 30	260 ± 180
	Waiteti Stream	200 ± 120	470 ± 180	2240 ± 760	20 ± 20	20 ± 20	840 ± 550	3780 ± 960	3090 ± 1050	1840 ± 580
	Hauparu Stream			20 ± 20				20 ± 20		70 ± 70
	Mangorewa River	120 ± 80		80 ± 60				200 ± 100	50 ± 30	

Catchment	River (reach) / Lake	2007/2008 Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total	2001/2002 total	1994/1995 total
Total, Kaituna catchment		11410 ± 1590	30410 ± 2730	22160 ± 1850	20180 ± 3200	8110 ± 1670	12580 ± 4080	104840 ± 6570	92210 ± 4630	105280 ± 6530
Waihi Estuary	Lake Rotoehu	160 ± 80	1670 ± 820	860 ± 610	130 ± 130	430 ± 430	460 ± 460	3720 ± 1210	2190 ± 770	2290 ± 580
	Lake Rotoma	1060 ± 290	4720 ± 1210	1310 ± 440	1620 ± 990	1800 ± 1130	610 ± 400	11110 ± 2040	9210 ± 1230	6610 ± 1290
	Pongakawa Stream									60 ± 40
Tarawera River	Lake Okareka	140 ± 100	260 ± 160	390 ± 190	290 ± 190	590 ± 360	370 ± 220	2040 ± 530	3750 ± 1240	3410 ± 800
	Lake Okaro	30 ± 30		40 ± 40	170 ± 170		30 ± 30	260 ± 170	200 ± 120	100 ± 70
	Lake Okataina	1090 ± 560	830 ± 210	1070 ± 280	1310 ± 470	1130 ± 490	860 ± 490	6290 ± 1070	6830 ± 860	5830 ± 940
	Lake Rerewhakaaitu	460 ± 290	1060 ± 410	470 ± 160	270 ± 210	790 ± 430	790 ± 370	3830 ± 800	8070 ± 1310	9390 ± 1660
	Lake Rotokakahi	60 ± 60	100 ± 100		40 ± 40	40 ± 40		240 ± 130	20 ± 20	920 ± 900
	Lake Rotomahana		30 ± 20	40 ± 40				70 ± 50	820 ± 380	1220 ± 420
	Lake Tarawera	5160 ± 1020	11440 ± 1580	6890 ± 980	3930 ± 740	2100 ± 800	4700 ± 2470	34220 ± 3440	41800 ± 2910	38440 ± 3990
	Ruruanga Stream								1880 ± 1070	180 ± 100
Tarawera River	(reach unspecified)	60 ± 40	70 ± 50	160 ± 160	80 ± 80	20 ± 20	40 ± 40	430 ± 200	1390 ± 560	5010 ± 1180
Tarawera River	(Lake outlet to falls)	250 ± 110					50 ± 50	300 ± 120	640 ± 290	
Tarawera River	(below falls)			40 ± 40	40 ± 40		520 ± 430	600 ± 440	2040 ± 630	
Tarawera River Total		300 ± 120	70 ± 50	200 ± 170	120 ± 90	20 ± 20	610 ± 440	1320 ± 500	4070 ± 890	5010 ± 1180
	Waiwhakapa Stream	70 ± 70						70 ± 70	40 ± 30	
	Lake Tikitapu (Blue Lake)		100 ± 40	90 ± 70	40 ± 40		140 ± 100	370 ± 140	470 ± 190	260 ± 160
	Waiaute Stream				100 ± 100			100 ± 100		
Total, Tarawera catchment		7300 ± 1210	13880 ± 1660	9190 ± 1070	6260 ± 950	4670 ± 1090	7490 ± 2600	48790 ± 3770	66070 ± 3670	64750 ± 4760
Rangitaiki River	Flaxy Canal			90 ± 60	740 ± 520			820 ± 530	590 ± 410	
	Horomanga River	100 ± 60	70 ± 50	1190 ± 1040	430 ± 410			1790 ± 1120	190 ± 90	1240 ± 430
	Lake Aniwhenua	360 ± 120	580 ± 240	1150 ± 390	210 ± 170	20 ± 20	50 ± 50	2360 ± 500	9840 ± 2800	11330 ± 1640
	Lake Flaxy	120 ± 70	630 ± 470	230 ± 130	330 ± 240		160 ± 130	1470 ± 560	2410 ± 740	1520 ± 440
	Lake Matahina		20 ± 20	10 ± 10	140 ± 130		190 ± 190	360 ± 230	590 ± 280	880 ± 400

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Ngatamawahine Stream	20 ± 20	30 ± 30					50 ± 40	30 ± 30	
	Otamatea River	60 ± 60	40 ± 40	280 ± 280	60 ± 60			430 ± 300	< 10	
	Otangimoana Stream									20 ± 20
Rangitaiki River	(reach unspecified)	70 ± 50	310 ± 160	610 ± 200		30 ± 30	310 ± 170	1330 ± 310	2020 ± 630	
Rangitaiki River	(above Lake Aniwhenua)	210 ± 120	440 ± 200	550 ± 240	190 ± 130	40 ± 40	790 ± 550	2210 ± 650	4400 ± 1560	1410 ± 430
Rangitaiki River	(Aniwhenua to Matahina)	< 10	340 ± 260	450 ± 250	270 ± 190	110 ± 110		1180 ± 420	2360 ± 1570	3560 ± 1190
Rangitaiki River	(below Matahina Dam)		40 ± 40	30 ± 30	210 ± 150		50 ± 50	320 ± 160	770 ± 250	720 ± 210
Rangitaiki River	Total	290 ± 130	1120 ± 370	1640 ± 400	660 ± 270	170 ± 120	1150 ± 570	5030 ± 850	9540 ± 2300	5680 ± 1280
	Waihua Stream	100 ± 60		20 ± 20				120 ± 60	270 ± 120	310 ± 300
	Wheao River	50 ± 40	360 ± 280	90 ± 60				510 ± 290	400 ± 160	550 ± 180
	Whirinaki River	550 ± 360	140 ± 110	460 ± 220	820 ± 530		210 ± 110	2180 ± 690	750 ± 230	1710 ± 520
Total, Rangitaiki catchment		1640 ± 420	2990 ± 710	5150 ± 1240	3380 ± 950	190 ± 120	1760 ± 630	15110 ± 1880	24610 ± 3760	23240 ± 2290
Whakatane River	Ruatahuna Stream		40 ± 30					40 ± 30	30 ± 30	
	Urewera Stream								< 10	
	Waikare River			10 ± 10				10 ± 10	270 ± 260	
	Waimana River	170 ± 100	60 ± 50	50 ± 30	780 ± 550			1060 ± 570	480 ± 180	1920 ± 670
	Whakatane River	60 ± 40	120 ± 110	340 ± 270	1070 ± 720			1590 ± 780	1450 ± 530	2230 ± 800
Total, Whakatane catchment		230 ± 110	220 ± 120	390 ± 280	1850 ± 910			2690 ± 970	2230 ± 610	4150 ± 1040
Waiotahi River	Waiotahi River								90 ± 60	110 ± 60
Waioeka River	Kahunui Stream								30 ± 30	
	Koranga River		< 10					< 10	30 ± 30	
	Opato Stream								80 ± 40	
	Waioeka River	80 ± 50	420 ± 350	160 ± 70	700 ± 510	100 ± 80	120 ± 70	1570 ± 630	1540 ± 510	2480 ± 1240
	Wairata Stream		50 ± 50	40 ± 40				90 ± 60	410 ± 260	110 ± 80
Total, Waioeka catchment		80 ± 50	470 ± 350	200 ± 80	700 ± 510	100 ± 80	120 ± 70	1670 ± 640	2080 ± 580	2590 ± 1240

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
Otara River	Otara River	50 ± 50	210 ± 210	40 ± 40				290 ± 220	60 ± 40	260 ± 160
Motu River	Motu River		60 ± 40	370 ± 220	80 ± 80			510 ± 240	1290 ± 400	240 ± 130
	Takaputahi River								40 ± 30	40 ± 40
Haparapara River	Haparapara River								40 ± 40	
Raukokore River	Raukokore River	90 ± 70		40 ± 40				130 ± 80		
Mata River	Mata River									50 ± 50
	Waingakia Stream		10 ± 10					10 ± 10		
Waipaoa River	Waipaoa River	20 ± 20		30 ± 30				50 ± 30		
	Wharekopae River	10 ± 10		20 ± 20				30 ± 30	80 ± 80	
Kopuawhara Stream	Kopuawhara Stream		210 ± 210	40 ± 40				250 ± 210		
Wairoa River	Aniwaniwa Stream	90 ± 50		80 ± 80			80 ± 80	240 ± 120	130 ± 90	
	Hangaroa River	80 ± 50	520 ± 520	210 ± 90				810 ± 530	450 ± 160	620 ± 420
	Hopuruahine Stream		10 ± 10					10 ± 10	180 ± 100	
	Lake Kaitawa	30 ± 30						30 ± 30	50 ± 50	180 ± 180
	Lake Tuai	< 10		10 ± 10		30 ± 30		50 ± 40	20 ± 20	1200 ± 460
	Lake Waikareiti	20 ± 20	240 ± 210	80 ± 40	20 ± 20			360 ± 220	250 ± 90	510 ± 280
	Lake Waikaremoana	1870 ± 440	6070 ± 1170	1610 ± 390	1990 ± 670	330 ± 120	1120 ± 680	12990 ± 1620	18770 ± 2000	20620 ± 2190
	Mangaone Stream	20 ± 20	80 ± 60		110 ± 60			200 ± 90	70 ± 40	
	Mangapapa Stream								20 ± 20	
	Mangapoike River	20 ± 20						20 ± 20	30 ± 30	
	Mokau Stream								60 ± 60	
	Ruakituri River	430 ± 320	660 ± 280	480 ± 260	400 ± 270	170 ± 120	50 ± 50	2180 ± 580	1420 ± 260	2390 ± 620
	Waiau River	190 ± 110	80 ± 50	130 ± 90				400 ± 150	200 ± 130	280 ± 160
	Waikaretaheke River	80 ± 80	< 10					90 ± 80	20 ± 20	
	Wairoa River			40 ± 30				40 ± 30	40 ± 30	

Catchment	River (reach) / Lake	2007/2008 Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total	2001/2002 total	1994/1995 total
Total, Wairoa catchment		2820 ± 570	7670 ± 1330	2630 ± 490	2510 ± 730	530 ± 170	1240 ± 690	17400 ± 1830	21700 ± 2040	25790 ± 2390
Waikato River	Lake Aratiatia								80 ± 50	180 ± 100
	Lake Atiamuri	330 ± 280	190 ± 140				280 ± 280	800 ± 420	570 ± 270	540 ± 230
	Lake Maraetai	20 ± 20	50 ± 50	170 ± 100	280 ± 240	400 ± 290	230 ± 170	1140 ± 430	800 ± 360	650 ± 320
	Lake Ngahewa	270 ± 270		30 ± 30				300 ± 270	30 ± 30	
	Lake Ngapouri			20 ± 20			40 ± 40	60 ± 50	170 ± 90	80 ± 60
	Lake Ohakuri		30 ± 20		100 ± 100	430 ± 430	30 ± 30	580 ± 440	1220 ± 530	2560 ± 740
	Lake Rotoaira	110 ± 60	70 ± 40	60 ± 40	20 ± 20	60 ± 60	130 ± 130	440 ± 160	90 ± 50	
	Lake Whakamaru	90 ± 40	160 ± 90	70 ± 60	30 ± 20	70 ± 70	590 ± 480	1010 ± 500	570 ± 170	3360 ± 1050
	Pueto Stream			10 ± 10				10 ± 10		80 ± 50
	Ruatawiri Stream								100 ± 100	
	Tahunaatara Stream	50 ± 50						50 ± 50	260 ± 210	440 ± 310
	Torepatutahi Stream		100 ± 90					100 ± 90	180 ± 130	190 ± 120
	Waikato River (Huka Falls to L Ohakuri)	260 ± 150	940 ± 450	310 ± 170	110 ± 60	540 ± 540		2150 ± 740	1930 ± 1080	
	Whirinaki River			580 ± 470				580 ± 470	410 ± 160	110 ± 80
Total, Waikato catchment		1120 ± 420	1540 ± 500	1250 ± 510	530 ± 270	1500 ± 750	1280 ± 600	7220 ± 1300	6400 ± 1340	8190 ± 1390
Total, all waters		**26410 ± 2200**	**64520 ± 3890**	**44200 ± 2710**	**37240 ± 3840**	**17330 ± 2460**	**25930 ± 5000**	**215630 ± 8550**	**231330 ± 7650**	**246700 ± 9130**

Taranaki Region

Catchment	River (reach) / Lake	2007/2008 Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total	2001/2002 total	1994/1995 total
Turakina River	Lake Namunamu	10 ± 10	< 10		< 10			30 ± 20	30 ± 20	300 ± 110
	Turakina River									60 ± 60
Whangaehu River	Lake Lahar								< 10	
	Lake Ohakune			20 ± 20	20 ± 20			40 ± 30		110 ± 40
	Lake Rotokura (Karioi)	50 ± 50	380 ± 380	< 10				430 ± 380	10 ± 10	110 ± 40
	Makotuku Stream					10 ± 10		10 ± 10	< 10	
	Mangawhero River	< 10	70 ± 30	170 ± 60	100 ± 70		80 ± 70	420 ± 120	430 ± 140	620 ± 180
	Omarae Stream			60 ± 50				60 ± 50		10 ± 10
	Raetihi Hydro Dam			10 ± 10	20 ± 20			30 ± 20		
	Taonui Stream	20 ± 10		30 ± 30				50 ± 30	70 ± 40	400 ± 260
	Tokiahuru Stream								30 ± 20	80 ± 40
	Waitaiki Stream				20 ± 20	20 ± 20		40 ± 40	40 ± 20	30 ± 20
	Waitangi Stream	< 10	10 ± 10					20 ± 10		
	Whangaehu River									< 10
Total, Whangaehu catchment		80 ± 50	460 ± 380	300 ± 90	160 ± 80	30 ± 20	80 ± 70	1100 ± 410	600 ± 150	1370 ± 320
Kaitoke Stream	Lake Kohata								110 ± 40	
	Lake Pauri			20 ± 20				20 ± 20	< 10	40 ± 30
	Lake Wiritoa	30 ± 20	40 ± 20	20 ± 20			20 ± 20	100 ± 40	50 ± 30	10 ± 10
Whanganui River	Lake Virginia								100 ± 60	320 ± 80
	Makatote River		< 10					< 10		120 ± 90
	Manganui-o-te-ao River	320 ± 80	790 ± 370	600 ± 280	460 ± 200		210 ± 110	2380 ± 520	760 ± 140	1970 ± 250
	Orautoha Stream		80 ± 70					80 ± 70	30 ± 30	

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Retaruke River		60 ± 40	40 ± 30				100 ± 50	80 ± 50	80 ± 60
	Ruatiti Stream	30 ± 10	40 ± 20	40 ± 20	< 10		30 ± 30	140 ± 40		30 ± 30
	Waimarino Stream	50 ± 40						50 ± 40	40 ± 20	20 ± 10
	Whangamomona River			30 ± 30				30 ± 30		
Whanganui River (reach unspecified)		710 ± 300	350 ± 140	450 ± 150	260 ± 130	50 ± 50	80 ± 80	1890 ± 400	430 ± 160	4320 ± 590
Whanganui River (below Ohura confluence)			110 ± 80	40 ± 30	150 ± 90	< 10	80 ± 80	370 ± 150		
Whanganui River Total		710 ± 300	460 ± 160	480 ± 150	400 ± 160	50 ± 50	160 ± 120	2260 ± 430		
Total, Whanganui catchment		1100 ± 310	1440 ± 410	1190 ± 330	870 ± 260	50 ± 50	400 ± 160	5040 ± 680	1440 ± 230	*4320 ± 590*
Waitotara River	Lake Waiau	< 10		10 ± 10		250 ± 250		270 ± 250		
	Omahine Stream								70 ± 40	< 10
	Waitotara River			< 10				< 10		
Patea River	Kahouri Stream									40 ± 40
	Konini Stream									20 ± 20
	Lake Rotorangi	< 10	60 ± 50	60 ± 50				130 ± 70	150 ± 60	230 ± 70
	Makuri Stream									110 ± 90
	Mangaehu Stream			10 ± 10				10 ± 10		
	Patea River	400 ± 170	640 ± 240	280 ± 110	60 ± 40	10 ± 10	50 ± 50	1450 ± 320	880 ± 280	280 ± 120
	Piakau South Stream									40 ± 30
Total, Patea catchment		410 ± 170	700 ± 240	350 ± 120	60 ± 40	10 ± 10	50 ± 50	1590 ± 330	1030 ± 290	720 ± 170
Waingongoro River	Mangatoki Stream	< 10		10 ± 10				10 ± 10	30 ± 20	200 ± 120
	Waingongoro River	260 ± 50	370 ± 130	110 ± 80	160 ± 80		300 ± 220	1210 ± 290	1010 ± 180	1550 ± 240
Kapuni Stream	Kapuni Stream	20 ± 10	30 ± 30	< 10				50 ± 30	110 ± 40	50 ± 20
Waiokura Stream	Waiokura Stream	30 ± 20		180 ± 180				210 ± 180	20 ± 20	

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
Kaupokonui Stream	Dunns Creek								< 10	
	Kaupokonui Stream	90 ± 40	40 ± 30	40 ± 20			110 ± 110	290 ± 130	230 ± 90	160 ± 110
	Mangawhero Stream	20 ± 20						20 ± 20	30 ± 20	
	Mangawheroiti Stream	50 ± 50						50 ± 50		
Otakeho Stream	Otakeho Stream	20 ± 20	< 10	20 ± 20				40 ± 30	< 10	
Taungatara Stream	Taungatara Stream	< 10		20 ± 20		220 ± 220		230 ± 220		< 10
Mangahume Stream	Mangahume Stream								< 10	10 ± 10
Waiaua River	Lake Opunake	60 ± 10	30 ± 20	60 ± 60			60 ± 70	210 ± 90	< 10	30 ± 20
	Waiaua River	< 10	20 ± 20	20 ± 20				50 ± 30	< 10	100 ± 40
Oaonui Stream	Oaonui Stream		< 10					< 10	50 ± 50	
Okahu Stream	Okahu Stream	10 ± 10	< 10	20 ± 20				40 ± 20	< 10	80 ± 50
Pungaereere Stream	Pungaereere Stream	< 10				140 ± 140		150 ± 140		
Waitotoroa Stream	Waitotoroa Stream								10 ± 10	
Kapoaiaia Stream	Kapoaiaia Stream								< 10	
Warea River	Warea River	40 ± 30	40 ± 20	10 ± 10	20 ± 20		30 ± 20	130 ± 50	30 ± 20	30 ± 10
Waiweranui Stream	Waiweranui Stream	< 10		30 ± 30			40 ± 40	80 ± 50	< 10	
Stony River	Stony River	50 ± 30	80 ± 70	40 ± 30	50 ± 50		40 ± 40	270 ± 110	410 ± 140	150 ± 40
Timaru Stream	Timaru Stream	< 10	130 ± 110					130 ± 110	< 10	30 ± 10
Oakura River	Oakura River	70 ± 50		10 ± 10				80 ± 50	40 ± 30	30 ± 10
Tapuae Stream	Tapuae Stream	20 ± 20						20 ± 20		
Huatoki Stream	Huatoki Stream									60 ± 30
Te Henui Stream	Te Henui Stream	30 ± 30	40 ± 20					60 ± 40	20 ± 20	290 ± 140
Waiwhakaiho River	Kaiauai Stream	30 ± 20	20 ± 20	30 ± 20				70 ± 30		100 ± 50

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Lake Mangamahoe	190 ± 90	280 ± 120	140 ± 70	90 ± 60	110 ± 70	1100 ± 840	1920 ± 860	830 ± 200	1380 ± 230
	Lake Rotomanu	170 ± 70	90 ± 50	40 ± 30				300 ± 90	630 ± 260	720 ± 160
	Mangorei Stream		20 ± 20					20 ± 20		110 ± 70
	Waiwhakaiho River	400 ± 90	440 ± 120	230 ± 90	50 ± 50		110 ± 80	1240 ± 200	340 ± 120	540 ± 120
	Mangawarawara Stream					40 ± 40		40 ± 40		
Total, Waiwhakaiho catchment		790 ± 150	850 ± 180	440 ± 120	140 ± 80	140 ± 80	1220 ± 840	3580 ± 890	1790 ± 350	2840 ± 310
Waiongana Stream	Mangaoraka Stream	20 ± 20	< 10			30 ± 30		60 ± 30	90 ± 60	190 ± 110
	Waiongana Stream	20 ± 10	30 ± 30	40 ± 30				90 ± 40	20 ± 20	100 ± 50
Waitara River	Lake Cowley			< 10				< 10		80 ± 30
	Lake Ngangana	50 ± 30	40 ± 30	20 ± 20				100 ± 40	200 ± 60	
	Lake Ratapiko	150 ± 50	90 ± 50	230 ± 170	180 ± 170			650 ± 250	340 ± 120	
	Maketawa Stream	50 ± 20	< 10					60 ± 20	40 ± 20	100 ± 40
	Mangamawhete Stream	20 ± 20						20 ± 20		< 10
	Manganui River	220 ± 90	220 ± 80	160 ± 100		< 10		600 ± 160	150 ± 60	160 ± 70
	Ngatoro Stream	50 ± 30		30 ± 20	60 ± 50			140 ± 60	< 10	40 ± 30
	Ngatoronui Stream	10 ± 10						10 ± 10		
	Te Popo Stream								10 ± 10	
	Waitara River	20 ± 20	20 ± 20	30 ± 20	50 ± 50			120 ± 60	10 ± 10	20 ± 10
Total, Waitara catchment		560 ± 110	380 ± 100	460 ± 200	300 ± 180	< 10		1710 ± 310	760 ± 150	410 ± 90
Otahi Stream	Otahi Stream	10 ± 10						10 ± 10		
Tangahoe River	Tawhiti Stream									< 10
Total, all waters		**3820 ± 420**	**4720 ± 670**	**3390 ± 480**	**1780 ± 350**	**870 ± 370**	**2340 ± 900**	**16920 ± 1390**	**8050 ± 610**	**13150 ± 850**

Hawkes Bay Region

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
Wairoa River	Mangamate Stream						20 ± 20	20 ± 20		
Mohaka River	Hautapu River	20 ± 20		160 ± 100				180 ± 100	40 ± 30	50 ± 20
	Inangatahi Stream	10 ± 10		10 ± 10			80 ± 80	100 ± 80	40 ± 20	140 ± 20
	Kaipo River	40 ± 30				20 ± 30		60 ± 40	30 ± 30	30 ± 10
	Makahu River								< 10	100 ± 10
	Mangatainoka River		40 ± 40	20 ± 20				60 ± 40	10 ± 10	200 ± 30
Mohaka River (unspecified)		160 ± 100	200 ± 150	760 ± 290	60 ± 30		1150 ± 610	2330 ± 700	660 ± 170	3770 ± 220
Mohaka River (above Mangatainoka)		430 ± 120	90 ± 40	840 ± 640	160 ± 90	300 ± 180	1660 ± 1670	3490 ± 1800	900 ± 230	
Mohaka River (Mangatainoka to SH5 bridge)		210 ± 70	770 ± 210	460 ± 120	490 ± 240	310 ± 150		2240 ± 380	2350 ± 350	
Mohaka River (below SH5 bridge)		280 ± 90	370 ± 120	910 ± 270	560 ± 230		140 ± 100	2240 ± 400	3170 ± 560	
Mohaka River Total		1080 ± 190	1430 ± 290	2970 ± 770	1270 ± 350	610 ± 240	2950 ± 1780	10300 ± 2010	7070 ± 720	3770 ± 220
	Oamaru River		< 10	30 ± 30				40 ± 30	70 ± 60	
	Ripia River			30 ± 30				30 ± 30	190 ± 70	140 ± 20
	Te Hoe River	50 ± 50		80 ± 60				130 ± 80	< 10	10 ± 10
	Toropapa Stream								10 ± 10	
	Waipunga River	< 10	20 ± 10	170 ± 70	70 ± 70		80 ± 80	350 ± 130	340 ± 110	50 ± 20
	Mokomokonui River								< 10	
Total, Mohaka catchment		1200 ± 200	1500 ± 290	3460 ± 780	1340 ± 360	630 ± 240	3110 ± 1780	11240 ± 2020	7830 ± 730	4490 ± 220
Waikari River	Waikari River	120 ± 80		150 ± 110				270 ± 140	< 10	120 ± 40
Aropaoanui River	Aropaoanui River		40 ± 40	40 ± 30				80 ± 50		
	Lake Opouahi		30 ± 20					30 ± 20	10 ± 10	
	Lake Tutira	130 ± 50	130 ± 70	250 ± 80	130 ± 80	980 ± 480	20 ± 20	1640 ± 500	2340 ± 380	3090 ± 150
	Waikoau River								370 ± 280	70 ± 10

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Lake Orakai					80 ± 80	560 ± 560	640 ± 560		
Total, Aropaoanui catchment		130 ± 50	190 ± 80	290 ± 90	130 ± 80	1070 ± 490	580 ± 560	2390 ± 750	2720 ± 480	3160 ± 150
Esk River	Esk River	250 ± 90	210 ± 90	100 ± 40	220 ± 130		90 ± 90	870 ± 200	190 ± 50	1950 ± 90
Tutaekuri River	Donald River								< 10	
	Lake Te Pohue			< 10	20 ± 20			30 ± 30	10 ± 10	260 ± 40
	Mangaone River	130 ± 70		50 ± 50				180 ± 90	390 ± 130	370 ± 30
	Mangatutu Stream	< 10	200 ± 90	350 ± 280				560 ± 290	110 ± 60	300 ± 40
	Tutaekuri River	1180 ± 280	930 ± 200	1040 ± 240	390 ± 170	600 ± 320	660 ± 280	4780 ± 620	6730 ± 780	7130 ± 240
	Twin Lakes	160 ± 160			70 ± 70			230 ± 180	220 ± 110	
Total, Tutaekuri catchment		1470 ± 330	1130 ± 220	1450 ± 370	480 ± 190	600 ± 320	660 ± 280	5790 ± 710	7470 ± 800	8060 ± 250
Ngaruroro River	Ikawetea Stream								70 ± 70	
	Mangatahi Stream		80 ± 80	30 ± 20	70 ± 70			180 ± 110	70 ± 70	
	Mangatarata Stream								40 ± 40	
Ngaruroro River (reach unspecified)		< 10	120 ± 70	100 ± 60			350 ± 240	580 ± 250	110 ± 50	3760 ± 170
Ngaruroro River (above Taruarau confluence)		130 ± 50	240 ± 80	50 ± 30		110 ± 110	20 ± 20	550 ± 160	980 ± 280	
Ngaruroro River (below Taruarau confluence)		370 ± 140	610 ± 180	430 ± 170	170 ± 80		110 ± 70	1680 ± 300	5150 ± 660	
Ngaruroro River Total		510 ± 150	970 ± 210	580 ± 180	170 ± 80	110 ± 110	480 ± 250	2810 ± 420	6240 ± 720	3760 ± 170
	Ohara Stream	30 ± 20	< 10	10 ± 10		70 ± 70		120 ± 80	290 ± 140	170 ± 20
	Otamauri Stream		50 ± 40					50 ± 40	10 ± 10	
	Poporangi Stream									100 ± 20
	Taruarau River	180 ± 100	50 ± 40	40 ± 30				280 ± 110	360 ± 150	220 ± 80
	Tutaekuri Waimate Stream		30 ± 30					30 ± 30		
	Waitio Stream	20 ± 20						20 ± 20		
Total, Ngaruroro catchment		730 ± 180	1190 ± 230	670 ± 190	240 ± 110	180 ± 130	480 ± 250	3480 ± 460	7080 ± 760	4250 ± 190

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
Tukituki River	Maharakeke Stream								60 ± 30	
	Makaretu River	160 ± 160						160 ± 160	< 10	
	Makaroro River								40 ± 30	40 ± 0
	Mangaonuku Stream	10 ± 10		170 ± 120				180 ± 120	560 ± 190	200 ± 20
	Mangataura Stream			10 ± 10				10 ± 10	10 ± 10	100 ± 10
	Tukipo River			50 ± 40				50 ± 40	1050 ± 290	140 ± 80
Tukituki River (reach unspecified)		200 ± 80	130 ± 80	810 ± 470	210 ± 100		350 ± 230	1700 ± 540	470 ± 190	14020 ± 410
Tukituki River (above Waipawa confluence)		390 ± 150	700 ± 250	490 ± 210	20 ± 20	50 ± 30	40 ± 40	1680 ± 360	2490 ± 480	
Tukituki River (Waipawa to Patangata		350 ± 100	1980 ± 330	850 ± 230	490 ± 410	30 ± 30	130 ± 70	3830 ± 590	4110 ± 650	
Tukituki River (below Patangata)		710 ± 180	730 ± 460	1030 ± 290	200 ± 80		250 ± 90	2920 ± 590	10140 ± 1210	
Tukituki River Total		1660 ± 270	3540 ± 620	3180 ± 630	910 ± 430	80 ± 40	770 ± 260	10130 ± 1060	17210 ± 1470	14020 ± 410
	Waipawa River	50 ± 30	490 ± 180	420 ± 150	150 ± 60	140 ± 120	50 ± 50	1290 ± 270	2050 ± 390	610 ± 40
	Tangarewai Stream					90 ± 90		90 ± 90		
Total, Tukituki catchment		1880 ± 320	4030 ± 650	3840 ± 660	1060 ± 430	310 ± 160	820 ± 260	11920 ± 1110	21000 ± 1560	15100 ± 420
Maraetotara River	Maraetotara River	30 ± 20			70 ± 70			110 ± 80	140 ± 90	700 ± 190
Total, all waters		**5810 ± 550**	**8250 ± 790**	**9950 ± 1110**	**3550 ± 620**	**2790 ± 660**	**5760 ± 1930**	**36100 ± 2590**	**46480 ± 2100**	**37840 ± 630**

Wellington Region

Catchment	River (reach) / Lake	2007/2008 Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total	2001/2002 total	1994/1995 total
Pahaoa River	Pahaoa River								10 ± 10	
	Wainuioru Stream								20 ± 20	
Ruamahanga River	Atiwhakatu Stream								30 ± 30	
	Huangarua River	50 ± 50		10 ± 10				60 ± 50	60 ± 40	
	Kopuaranga River	70 ± 60	130 ± 80	110 ± 90				310 ± 130	520 ± 190	520 ± 240
	Kourarau Dam		90 ± 60	140 ± 140				230 ± 150	610 ± 170	850 ± 230
	Lake Henley			270 ± 270				270 ± 270	280 ± 250	2250 ± 800
	Lake Onoke		10 ± 10					10 ± 10	30 ± 20	
	Lake Wairarapa		20 ± 20	90 ± 70				110 ± 70	150 ± 80	200 ± 140
	Mangatarere Stream								160 ± 90	260 ± 130
	Oporua Spillway			160 ± 160				160 ± 160		80 ± 80
Ruamahanga River (reach unspecified)		10 ± 10	880 ± 260	570 ± 260				1460 ± 370	330 ± 160	7390 ± 910
Ruamahanga River (above Mount Bruce)			30 ± 20					30 ± 20	160 ± 90	
Ruamahanga River (Mount Bruce to Masterton)		50 ± 40	40 ± 30	220 ± 130			300 ± 160	610 ± 210	360 ± 110	
Ruamahanga River (Masterton to Martinborough)		340 ± 130	500 ± 260	910 ± 340	1190 ± 350	160 ± 160	70 ± 30	3140 ± 590	4970 ± 720	
Ruamahanga River (Martinborough to L. Onoke)		60 ± 40	160 ± 70	600 ± 380	480 ± 420			1300 ± 570	1090 ± 300	
Ruamahanga River Total		450 ± 140	1600 ± 380	2300 ± 580	1670 ± 550	160 ± 160	360 ± 170	6540 ± 920	6910 ± 810	7390 ± 910
	Tauherenikau River		70 ± 40	50 ± 50	40 ± 40			160 ± 80	220 ± 150	360 ± 280
	Tauweru River	230 ± 140		70 ± 70				300 ± 150	140 ± 60	50 ± 40
	Waingawa River		90 ± 50	50 ± 40				140 ± 70	140 ± 60	430 ± 210
	Waiohine River	40 ± 40	170 ± 70	250 ± 130	400 ± 340			860 ± 380	960 ± 460	1330 ± 410
	Waipoua River	40 ± 30	40 ± 30					80 ± 40	260 ± 180	140 ± 80
Total, Ruamahanga catchment		870 ± 210	2230 ± 410	3500 ± 710	2110 ± 650	160 ± 160	360 ± 170	9230 ± 1080	10470 ± 1030	13860 ± 1390

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
Orongorongo River	Orongorongo River								40 ± 40	
Wainuiomata River	Wainuiomata River	510 ± 240	550 ± 230	400 ± 200	110 ± 60			1560 ± 400	750 ± 170	2390 ± 590
Hutt River	Akatarawa River	50 ± 30	50 ± 30		130 ± 130			220 ± 130	320 ± 140	70 ± 70
	Hutt River	890 ± 260	1280 ± 280	560 ± 170	880 ± 430	60 ± 40	130 ± 100	3790 ± 610	6160 ± 830	19960 ± 2020
	Mangaroa River								< 10	120 ± 80
	Pakuratahi River								50 ± 50	50 ± 40
	Whakatikei River	10 ± 10	10 ± 10					20 ± 20	80 ± 70	70 ± 30
Total, Hutt catchment		940 ± 260	1340 ± 280	560 ± 170	1010 ± 450	60 ± 40	130 ± 100	4040 ± 620	6610 ± 850	20270 ± 2030
Korokoro Stream	Korokoro Stream									20 ± 20
Kaiwharawhara Stream	Kaiwharawhara Stream									20 ± 20
Karori Stream	Karori Stream									120 ± 80
Makara Stream	Makara Stream								70 ± 50	100 ± 60
Pauatahanui Stream	Whitby Lakes		20 ± 20					20 ± 20	410 ± 150	930 ± 500
Wainui Stream	Wainui Stream	10 ± 10	< 10					20 ± 20	70 ± 50	90 ± 80
Waikanae River	Waikanae River	430 ± 190	690 ± 340	260 ± 240	< 10	30 ± 30		1420 ± 450	420 ± 130	750 ± 190
Otaki River	Otaki River	250 ± 110	200 ± 90	170 ± 110	20 ± 10		60 ± 50	700 ± 180	350 ± 90	690 ± 220
Waitohu Stream	Lake Waitawa	90 ± 80	90 ± 60	180 ± 130	< 10			370 ± 160	140 ± 70	820 ± 540
	Waitohu Stream	40 ± 30		20 ± 20				70 ± 30		
Waikawa Stream	Lake Kopureherehere								210 ± 110	710 ± 350
	Waikawa Stream			10 ± 10				10 ± 10		
Ohau River	Ohau River	90 ± 40	50 ± 30			30 ± 30		170 ± 60	180 ± 90	230 ± 100
Manawatu River	Hokowhitu Lagoon			240 ± 240				240 ± 240	430 ± 260	220 ± 100
	Horopito Stream			10 ± 10				10 ± 10		
	Kahuterawa Stream									110 ± 50

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Makakahi River	50 ± 50			130 ± 130			180 ± 140	160 ± 70	1170 ± 460
	Makiekie River								< 10	110 ± 80
	Makuri River	180 ± 130	280 ± 210	50 ± 40	80 ± 50			590 ± 250	520 ± 130	820 ± 240
Manawatu River (reach unspecified)		370 ± 280	820 ± 290	400 ± 210	20 ± 20		30 ± 30	1650 ± 450	150 ± 60	11970 ± 1360
Manawatu River (above Dannevirke)		180 ± 150	250 ± 210	620 ± 380	460 ± 280	30 ± 30		1540 ± 540	1170 ± 340	
Manawatu River (Dannevirke to Woodville)		910 ± 350	1090 ± 390	1640 ± 560	810 ± 280	770 ± 630	140 ± 90	5360 ± 1030	3730 ± 710	
Manawatu River (Woodville to Palmerston North)		530 ± 310	850 ± 370	1400 ± 380	310 ± 160	1270 ± 830		4360 ± 1050	6820 ± 980	
Manawatu River (Palmerston North to Foxton)		150 ± 70	90 ± 70	720 ± 240	240 ± 150	90 ± 70	30 ± 30	1320 ± 310	2000 ± 400	
Manawatu River Total		2140 ± 570	3090 ± 650	4780 ± 840	1840 ± 460	2160 ± 1050	210 ± 100	14220 ± 1660	13860 ± 1320	11970 ± 1360
	Mangahao River	110 ± 100	320 ± 180	50 ± 40	40 ± 40	560 ± 560	50 ± 50	1120 ± 600	820 ± 220	210 ± 70
	Mangapuaka Stream								50 ± 30	
	Mangatainoka River	720 ± 400	150 ± 80	180 ± 80	150 ± 130	630 ± 560	160 ± 160	1990 ± 730	1670 ± 310	3040 ± 530
	Mangatoro Stream								30 ± 30	50 ± 40
	Oroua River	10 ± 10		180 ± 130	120 ± 90		100 ± 100	410 ± 180	610 ± 280	200 ± 90
	Pohangina River	330 ± 200	170 ± 70	840 ± 400	300 ± 140	120 ± 100	80 ± 70	1840 ± 490	920 ± 230	1400 ± 350
	Tiraumea River				40 ± 40			40 ± 40	< 10	50 ± 40
	Tokomaru River								50 ± 30	160 ± 80
	Turitea Stream		40 ± 40	< 10				50 ± 40	20 ± 20	100 ± 60
Total, Manawatu catchment		3540 ± 740	4060 ± 710	6320 ± 970	2700 ± 520	3470 ± 1320	580 ± 230	20670 ± 2010	19170 ± 1450	19610 ± 1600
Rangitikei River	Hautapu River	120 ± 90	60 ± 60	20 ± 20	< 10			220 ± 110	260 ± 130	1060 ± 450
	Kawhatau River	30 ± 20	20 ± 20		210 ± 150			250 ± 150	90 ± 50	330 ± 110
	Mangaohane Stream									30 ± 30
	Mangatera River			10 ± 10	40 ± 40			50 ± 40		
	Mangateweka Stream	70 ± 70						70 ± 70		90 ± 60

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Moawhango River		10 ± 10					10 ± 10	60 ± 40	190 ± 100
Rangitikei River (reach unspecified)		180 ± 100	560 ± 200	720 ± 250	260 ± 210	60 ± 60	80 ± 80	1860 ± 410	420 ± 150	5710 ± 700
Rangitikei River (above Mangaohane Bridge)		310 ± 180	520 ± 330	290 ± 130	260 ± 130	90 ± 70	120 ± 100	1590 ± 430	860 ± 170	
Rangitikei River (Mangaohane to Vinegar Hill)		280 ± 100	460 ± 210	410 ± 150	390 ± 170	60 ± 60	220 ± 170	1830 ± 370	2130 ± 380	
Rangitikei River (Vinegar Hill to Tangimoana)		30 ± 30	270 ± 120	260 ± 200	70 ± 40	160 ± 100	20 ± 20	790 ± 260	2490 ± 490	
Rangitikei River Total		800 ± 230	1810 ± 450	1670 ± 380	970 ± 300	370 ± 150	440 ± 210	6060 ± 750	5890 ± 660	5710 ± 700
	Whakaurekou River	40 ± 40					20 ± 30	60 ± 50	100 ± 80	
	Pourangaki River				80 ± 80			80 ± 80		
Total, Rangitikei catchment		1050 ± 260	1900 ± 460	1710 ± 380	1320 ± 350	370 ± 150	470 ± 220	6810 ± 780	6390 ± 680	7400 ± 850
Lake Alice	Lake Alice									10 ± 10
Total, all waters		**7820 ± 920**	**11140 ± 1070**	**13130 ± 1320**	**7280 ± 1010**	**4120 ± 1340**	**1600 ± 370**	**45080 ± 2580**	**45310 ± 2110**	**68030 ± 3230**

Nelson/Marlborough Region

Catchment	River (reach) / Lake	2007/2008 Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total	2001/2002 total	1994/1995 total
Aorere River	Aorere River	60 ± 30	570 ± 280	220 ± 120				850 ± 310	300 ± 80	650 ± 210
Takaka River	Anatoki River	20 ± 20						20 ± 20	40 ± 20	350 ± 240
	Cobb Reservoir		60 ± 50	40 ± 30				100 ± 50	220 ± 70	440 ± 130
	Cobb River	60 ± 30	40 ± 30					110 ± 40	260 ± 110	290 ± 90
	Takaka River (reach unspecified)	20 ± 20	190 ± 120	10 ± 10				220 ± 120	220 ± 100	1160 ± 350
	Takaka River (above Lindsay's Bridge)		60 ± 50	20 ± 20		30 ± 30	50 ± 50	170 ± 80	360 ± 110	
	Takaka River (below Lindsay's Bridge)		470 ± 320					470 ± 320	540 ± 150	
	Takaka River Total	20 ± 20	720 ± 350	40 ± 30		30 ± 30	50 ± 50	860 ± 350	1120 ± 210	1160 ± 350
	Waikoropupu River								80 ± 50	40 ± 40
	Waingaro River		30 ± 20					30 ± 20	50 ± 20	50 ± 40
Total, Takaka catchment		100 ± 40	860 ± 350	80 ± 40		30 ± 30	50 ± 50	1110 ± 360	1770 ± 260	2330 ± 450
Riwaka River	Riwaka River	70 ± 30	80 ± 50	170 ± 90				320 ± 110	570 ± 150	620 ± 220
Motueka River	Baton River	110 ± 50		30 ± 20			80 ± 80	220 ± 100	150 ± 40	440 ± 140
	Graham River								50 ± 20	
	Motueka River (reach unspecified)	80 ± 40	140 ± 70	550 ± 180	220 ± 130	50 ± 50	380 ± 180	1410 ± 300	1510 ± 470	10070 ± 1330
	Motueka River (above Wangapeka)	170 ± 90	360 ± 130	250 ± 80	50 ± 40	30 ± 30	70 ± 50	930 ± 190	1010 ± 180	
	Motueka River (below Wangapeka)	960 ± 290	650 ± 210	750 ± 180	130 ± 50	180 ± 130		2660 ± 420	3870 ± 430	
	Motueka River Total	1200 ± 310	1150 ± 250	1550 ± 270	400 ± 140	260 ± 140	440 ± 180	4990 ± 550	6390 ± 660	10070 ± 1330
	Motupiko River	70 ± 40						70 ± 40	290 ± 80	380 ± 150
	Pearse River								30 ± 20	270 ± 240
	Rainy River								10 ± 10	
	Rolling River								< 10	< 10
	Wangapeka River	130 ± 60	180 ± 70	440 ± 140			160 ± 100	910 ± 190	820 ± 140	970 ± 200
	Orinoco Creek								90 ± 60	

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
Total, Motueka catchment		1510 ± 320	1330 ± 260	2020 ± 300	400 ± 140	260 ± 140	680 ± 220	6190 ± 590	7830 ± 690	12130 ± 1380
Waimea River	Lee River				50 ± 50			50 ± 50	80 ± 30	130 ± 120
	Roding River								70 ± 60	
	Wai-iti River	110 ± 110		80 ± 60				190 ± 130	30 ± 20	100 ± 50
	Waimea River	120 ± 80	190 ± 120	180 ± 100	< 10			500 ± 170	240 ± 80	1780 ± 340
	Wairoa River	30 ± 20		170 ± 120				200 ± 120	550 ± 140	280 ± 90
Total, Waimea catchment		260 ± 140	190 ± 120	430 ± 170	60 ± 50			940 ± 250	980 ± 180	2290 ± 370
Maitai River	Maitai River	10 ± 10		40 ± 30	30 ± 30			90 ± 50	280 ± 170	180 ± 60
Wakapuaka River	Wakapuaka River		70 ± 50					70 ± 50	130 ± 70	280 ± 200
Whangamoa River	Whangamoa River	10 ± 10						10 ± 10	10 ± 10	
Pelorus River	Opouri River	20 ± 20						20 ± 20	130 ± 50	500 ± 250
Pelorus River (reach unspecified)		50 ± 30	< 10	100 ± 60		30 ± 30	70 ± 70	260 ± 100	320 ± 140	2100 ± 390
Pelorus River (above Pelorus Bridge)		70 ± 40	340 ± 140	60 ± 40	100 ± 70			570 ± 170	180 ± 60	
Pelorus River (below Pelorus Bridge)		450 ± 130	320 ± 110	50 ± 30	30 ± 30	20 ± 20		860 ± 180	1090 ± 200	
Pelorus River Total		570 ± 140	670 ± 180	210 ± 80	130 ± 80	40 ± 30	70 ± 70	1690 ± 260	1600 ± 260	2100 ± 390
	Rai River	730 ± 520	70 ± 40	140 ± 60	140 ± 130			1080 ± 540	740 ± 200	1440 ± 320
	Ronga River			< 10				< 10	20 ± 10	
	Tinline River									< 10
	Tunakino River								30 ± 20	< 10
	Wakamarina River	30 ± 30	10 ± 10	20 ± 20				60 ± 40	50 ± 30	
Total, Pelorus catchment		1350 ± 530	750 ± 180	380 ± 100	270 ± 150	40 ± 30	70 ± 70	2860 ± 600	2560 ± 330	4060 ± 560
Kaituna River	Kaituna River			190 ± 190				190 ± 190	30 ± 20	190 ± 180
Wairau River	Argyle Pond	80 ± 70	360 ± 180	240 ± 100	20 ± 20	30 ± 30		710 ± 220	940 ± 210	1280 ± 240
	Bartletts Creek								20 ± 10	20 ± 20
	Branch River	10 ± 10		< 10			40 ± 40	60 ± 40	20 ± 10	230 ± 120
	Goulter River	110 ± 60	20 ± 20	50 ± 50				180 ± 80	90 ± 40	30 ± 20

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Leatham River	30 ± 20	10 ± 10					40 ± 20	30 ± 20	100 ± 40
	Omaka River		260 ± 260					260 ± 260		
	Opawa River	10 ± 10	20 ± 20	90 ± 90	30 ± 30			160 ± 90	500 ± 200	870 ± 290
	Rainbow River		60 ± 30	30 ± 30				90 ± 40	30 ± 20	80 ± 40
	Roses Overflow			20 ± 20				20 ± 20		50 ± 40
	Spring Creek	280 ± 230	360 ± 250	300 ± 120				940 ± 360	360 ± 110	170 ± 70
	Taylor River			30 ± 30	30 ± 30			60 ± 40	180 ± 70	140 ± 110
	Timms Creek	10 ± 10			20 ± 20			30 ± 20		
	Top Valley Stream	10 ± 10						10 ± 10		
	Tuamarina River				60 ± 60			60 ± 60		20 ± 20
	Waihopai River								70 ± 40	100 ± 70
	Waikakaho River	20 ± 20	50 ± 30	10 ± 10				80 ± 40	160 ± 150	20 ± 10
	Wairau Diversion	610 ± 610		90 ± 70				700 ± 610	170 ± 170	
Wairau River (reach unspecified)		180 ± 140	280 ± 140	700 ± 310	20 ± 20	250 ± 250	80 ± 80	1510 ± 450	1230 ± 470	8480 ± 820
Wairau River (above Wash Bridge)		600 ± 260	610 ± 170	900 ± 480	50 ± 40	100 ± 80	80 ± 80	2330 ± 580	1430 ± 240	
Wairau River (below Wash Bridge)		1240 ± 340	1830 ± 440	1640 ± 320	860 ± 350	350 ± 290		5920 ± 780	5750 ± 680	
Wairau River Total		2020 ± 450	2720 ± 490	3240 ± 650	920 ± 350	700 ± 390	160 ± 120	9760 ± 1080	8410 ± 860	8480 ± 820
Total, Wairau catchment		3190 ± 800	3850 ± 630	4100 ± 680	1080 ± 360	730 ± 390	200 ± 120	13150 ± 1340	10970 ± 950	11560 ± 920
Awatere River	Awatere River	70 ± 60	80 ± 70		20 ± 20			160 ± 90	170 ± 110	200 ± 120
Clarence River	Acheron River		40 ± 30	280 ± 150				320 ± 150	50 ± 30	80 ± 60
	Alma River			60 ± 40				60 ± 40		40 ± 40
	Bowscale Tarn		200 ± 130		80 ± 80			270 ± 150	160 ± 130	
Clarence River (reach unspecified)		130 ± 110	230 ± 90	140 ± 80				490 ± 160	280 ± 130	840 ± 370
Clarence River (above Acheron)		120 ± 70	490 ± 260	780 ± 370				1390 ± 460	160 ± 90	
Clarence River (below Acheron)		220 ± 160	590 ± 440	320 ± 120				1130 ± 480	180 ± 80	
Clarence River Total		470 ± 210	1300 ± 510	1240 ± 400				3010 ± 680	620 ± 170	840 ± 370

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Lake McRae	10 ± 10						10 ± 10		
	Lake Tennyson	30 ± 30	60 ± 30	70 ± 50				150 ± 70	80 ± 50	450 ± 330
	Severn River								70 ± 60	20 ± 20
Total, Clarence catchment		510 ± 210	1590 ± 530	1650 ± 430	80 ± 80			3830 ± 720	970 ± 230	1420 ± 500
Kahutara River	Kahutara River								30 ± 30	
Lyell Creek	Lyell Creek								40 ± 40	
Conway River	Conway River	150 ± 150						150 ± 150	60 ± 40	10 ± 10
Buller River	Buller River (unspecified)	20 ± 20	100 ± 50	470 ± 160	40 ± 40		200 ± 170	840 ± 240	750 ± 360	3460 ± 640
	Buller River (Rotoiti to Gowanbridge)	160 ± 60	260 ± 100	130 ± 50			360 ± 170	910 ± 210	1320 ± 230	
	Buller River (Gowanbridge to Lyell)	10 ± 10	220 ± 90	190 ± 100				420 ± 130	660 ± 130	
	Buller River (below Lyell)								1580 ± 280	1600 ± 220
	Buller River Total	200 ± 60	580 ± 140	790 ± 190	40 ± 40		570 ± 230	2170 ± 340	4310 ± 520	5060 ± 680
	D`Urville River	140 ± 100	90 ± 90	260 ± 120	60 ± 50			560 ± 190	170 ± 60	90 ± 40
	Deepdale River			< 10				< 10	< 10	
	Fyfe River		20 ± 20					20 ± 20	10 ± 10	
	Glenroy River	10 ± 10		80 ± 60	20 ± 20			110 ± 70	90 ± 40	70 ± 40
	Gowan River	20 ± 20	20 ± 20	60 ± 40			160 ± 110	270 ± 120	350 ± 110	70 ± 40
	Hope River	10 ± 10		< 10				20 ± 10	260 ± 100	40 ± 20
	Howard River	10 ± 10	10 ± 10				40 ± 40	60 ± 40	20 ± 20	
	Lake Daniells		20 ± 20	10 ± 10	< 10			40 ± 30	160 ± 90	230 ± 150
	Lake Rotoiti	290 ± 80	1000 ± 260	560 ± 150	150 ± 100			2000 ± 330	1970 ± 260	2060 ± 550
	Lake Rotoroa	180 ± 60	580 ± 460	300 ± 230	220 ± 140	90 ± 70	560 ± 410	1940 ± 680	2350 ± 470	1030 ± 220
	Mangles River	70 ± 40	180 ± 150	140 ± 80			80 ± 80	480 ± 190	180 ± 70	400 ± 140
	Maruia River	130 ± 60	320 ± 110	460 ± 140		40 ± 40	160 ± 110	1110 ± 220	1830 ± 880	1190 ± 370
	Matakitaki River	160 ± 80	80 ± 40	590 ± 240	50 ± 50		160 ± 110	1040 ± 280	560 ± 120	510 ± 160
	Matiri River	10 ± 10		20 ± 10	110 ± 110			130 ± 110	100 ± 40	100 ± 60

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Owen River	70 ± 30	30 ± 30	250 ± 80			160 ± 110	520 ± 140	320 ± 70	140 ± 70
	Rahu River			< 10				< 10		
	Sabine River	70 ± 40	20 ± 20	80 ± 60			40 ± 40	210 ± 80	150 ± 50	230 ± 90
	Speargrass Creek	< 10	10 ± 10					20 ± 10	10 ± 10	80 ± 80
	Station Creek			< 10				< 10	10 ± 10	
	Travers River	150 ± 70	10 ± 10	140 ± 90			40 ± 40	340 ± 120	290 ± 80	450 ± 160
	Tutaki River	60 ± 50	30 ± 20	20 ± 20				100 ± 50	90 ± 40	210 ± 80
	Warwick River			< 10				< 10	20 ± 20	
	Woolley River								50 ± 30	
Total, Buller catchment		1600 ± 220	3010 ± 590	3800 ± 480	650 ± 220	130 ± 80	1980 ± 530	11160 ± 980	13300 ± 1190	11930 ± 1040
Anatori River	Anatori River		10 ± 10					10 ± 10	60 ± 40	
Paturau River	Paturau River									< 10
Total, all waters		**8870 ± 1080**	**12390 ± 1160**	**13050 ± 1030**	**2580 ± 480**	**1190 ± 420**	**2980 ± 600**	**41070 ± 2090**	**40110 ± 1770**	**47870 ± 2220**

West Coast Region

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
Hope River	Hope River		240 ± 170	10 ± 10				250 ± 170	10 ± 10	
Cascade River	Cascade River		120 ± 60	20 ± 20	20 ± 20			150 ± 70	50 ± 20	200 ± 80
	Martyr River									30 ± 30
Arawata River	Arawata River	50 ± 50	160 ± 90	20 ± 20	20 ± 20			240 ± 100	330 ± 190	200 ± 180
	Jackson River	70 ± 70	60 ± 40	30 ± 30			150 ± 150	300 ± 170	30 ± 30	80 ± 40
	Lake Ellery	< 10	< 10	40 ± 30				60 ± 40		70 ± 40
Waiatoto River	Waiatoto River	70 ± 70						70 ± 70	190 ± 170	
Hapuka River	Hapuka River			30 ± 30				30 ± 30		20 ± 20
Turnbull River	Turnbull River		110 ± 70	10 ± 10	70 ± 60			190 ± 90	270 ± 180	70 ± 30
Okuru River	Okuru River	260 ± 260	150 ± 120	80 ± 60	50 ± 50			540 ± 300	100 ± 60	220 ± 120
Haast River	Haast River	520 ± 480	150 ± 130	240 ± 140				910 ± 520	420 ± 180	370 ± 150
	Landsborough River								< 10	
	Thomas River		10 ± 10	170 ± 120				180 ± 120	170 ± 120	20 ± 20
	Burke River			30 ± 30				30 ± 30		
Waita River	Waita River								< 10	
Moeraki River	Lake Moeraki	140 ± 110	90 ± 40	140 ± 90	20 ± 20		80 ± 80	460 ± 170	130 ± 60	40 ± 20
	Moeraki River	60 ± 60	150 ± 130	40 ± 30	60 ± 60			300 ± 160		40 ± 30
Paringa River	Lake Paringa	160 ± 70	170 ± 90	650 ± 240				980 ± 270	220 ± 90	480 ± 130
	Paringa River	20 ± 10	140 ± 90	170 ± 60	30 ± 30			360 ± 110	100 ± 70	130 ± 90
	The Windbag			30 ± 30				30 ± 30		
Mahitahi River	Mahitahi River		50 ± 50		20 ± 20			70 ± 60	10 ± 10	60 ± 60
Jacobs River	Jacobs River	20 ± 20	< 10		50 ± 50			80 ± 50	180 ± 90	140 ± 60
Karangarua River	Copland River								80 ± 80	< 10

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Karangarua River	40 ± 30	20 ± 20	30 ± 30				90 ± 40	140 ± 90	50 ± 40
Waikukupa River	Waikukupa River		60 ± 60					60 ± 60		
Okarito River	Lake Mapourika	140 ± 70	540 ± 190	1830 ± 550				2510 ± 580	950 ± 160	1460 ± 490
	Lake Wahapo	20 ± 20	50 ± 40	50 ± 50	50 ± 50			170 ± 80	90 ± 70	< 10
	Okarito River	180 ± 90	210 ± 100	240 ± 180	80 ± 80			700 ± 240	310 ± 100	30 ± 20
Waitangi-taona River	Vickers Creek		< 10	30 ± 30				40 ± 30		
	Waitangi-taona River	100 ± 70	90 ± 50	160 ± 90	80 ± 50			430 ± 140	250 ± 120	100 ± 30
Whataroa River	Whataroa River	10 ± 10	60 ± 30	50 ± 30	60 ± 50			180 ± 70	60 ± 30	30 ± 20
Poerua River	Poerua River			40 ± 30				40 ± 30	70 ± 40	80 ± 40
Wanganui River	Berry Creek		< 10	110 ± 90				120 ± 90		
	Ianthe Creek	20 ± 20						20 ± 20		
	La Fontaine Stream	180 ± 90	150 ± 60	160 ± 90			80 ± 80	570 ± 160	240 ± 90	280 ± 130
	Lake Ianthe	260 ± 80	240 ± 120	30 ± 30	50 ± 50			580 ± 160	250 ± 80	140 ± 40
	Wanganui River		70 ± 60	40 ± 30				110 ± 70	110 ± 40	110 ± 100
Total, Wanganui catchment		460 ± 120	470 ± 150	340 ± 130	50 ± 50		80 ± 80	1390 ± 250	590 ± 130	540 ± 160
Waitaha River	Ellis Creek		< 10					< 10		
	Kakapotahi River	20 ± 20	10 ± 10	10 ± 10				50 ± 30	110 ± 70	60 ± 30
	Waitaha River	30 ± 30	150 ± 120	40 ± 20	120 ± 120		120 ± 70	440 ± 190	190 ± 160	190 ± 80
Mikonui River	Mikonui River	< 10			80 ± 80	310 ± 230	30 ± 30	440 ± 250	80 ± 50	
Totara River	Totara River	40 ± 40	40 ± 30	< 10	230 ± 240		50 ± 50	370 ± 250	130 ± 100	10 ± 10
Mahinapua Creek	Mahinapua Creek	50 ± 30	20 ± 20					60 ± 40	50 ± 20	80 ± 30
Hokitika River	Harris Creek	20 ± 10	60 ± 40					80 ± 40	120 ± 50	100 ± 20
	Hokitika River	910 ± 330	1380 ± 330	1120 ± 310	320 ± 210	1270 ± 610	1010 ± 470	6000 ± 980	1120 ± 290	940 ± 240
	Kaniere River	20 ± 10						20 ± 10	30 ± 20	30 ± 20

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Kokatahi River			110 ± 90				110 ± 90	40 ± 30	< 10
	Lake Kaniere		300 ± 210	100 ± 70	30 ± 30			440 ± 230	230 ± 100	500 ± 90
	Lake Mahinapua	10 ± 10	50 ± 40	20 ± 20			30 ± 30	120 ± 60	< 10	50 ± 40
	Murray Creek	< 10	< 10					10 ± 10	60 ± 30	50 ± 20
	Styx River		20 ± 20	50 ± 40			80 ± 80	150 ± 90	30 ± 20	30 ± 10
	Toaroha River								< 10	
	Whitcombe River	80 ± 80						80 ± 80		
Total, Hokitika catchment		1040 ± 340	1810 ± 400	1420 ± 330	350 ± 220	1270 ± 610	1120 ± 480	7010 ± 1020	1630 ± 320	1700 ± 260
Arahura River	Arahura River	140 ± 60	210 ± 80	660 ± 270				1020 ± 290	950 ± 300	220 ± 80
	Kawhaka Hydro		20 ± 20	< 10				20 ± 20	120 ± 60	< 10
Taramakau River	Big Hohonu River	10 ± 10						10 ± 10	20 ± 20	20 ± 10
	Bruce Creek	60 ± 60		50 ± 50				110 ± 80	90 ± 40	150 ± 90
	Clear Creek		30 ± 30					30 ± 30	< 10	
	Dredge Ponds								10 ± 10	
	Kapitea (Dillmans Reservoir		50 ± 40	40 ± 40			130 ± 130	220 ± 140	10 ± 10	
	Nicholas Creek								< 10	
	Otira River	30 ± 30						30 ± 30		
	Taipo River	30 ± 30	40 ± 40					70 ± 50	30 ± 30	10 ± 10
	Taramakau River	220 ± 150	660 ± 290	1100 ± 310	300 ± 220		130 ± 90	2420 ± 510	1720 ± 350	1890 ± 390
Total, Taramakau catchment		350 ± 160	780 ± 290	1200 ± 310	300 ± 220		270 ± 160	2890 ± 530	1880 ± 350	2070 ± 400
New River	New River			< 10				< 10	170 ± 80	10 ± 10
Grey River	Ahaura River	80 ± 60	130 ± 60	290 ± 160		80 ± 80		580 ± 200	610 ± 150	680 ± 170
Arnold River (reach unspecified)		40 ± 40	60 ± 30	400 ± 280			240 ± 140	740 ± 320	510 ± 150	1600 ± 430
Arnold River (Lake Brunner to dam)		40 ± 30	210 ± 90	140 ± 70				390 ± 110	570 ± 130	

Catchment	River (reach) / Lake	2007/2008 Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total	2001/2002 total	1994/1995 total
Arnold River (Dam to Stillwater)		60 ± 20	300 ± 130	60 ± 40		100 ± 100	100 ± 100	610 ± 200	350 ± 80	
Arnold River Total		140 ± 50	560 ± 160	610 ± 290		100 ± 100	340 ± 170	1750 ± 390	1430 ± 210	1600 ± 430
	Big River			30 ± 30				30 ± 30	60 ± 40	130 ± 50
	Blackwater River					50 ± 50		50 ± 50	100 ± 60	
	Blue Grey River									50 ± 30
	Brown Grey River			30 ± 20				30 ± 20	100 ± 50	
	Clarke River		20 ± 20					20 ± 20	30 ± 10	20 ± 20
	Crooked River	50 ± 30	150 ± 50	600 ± 260			80 ± 80	880 ± 280	870 ± 170	590 ± 390
	Deep Creek			40 ± 30				40 ± 30	10 ± 10	< 10
	Eastern Hohonu River								100 ± 80	
Grey River (reach unspecified)		20 ± 20	240 ± 130	560 ± 200	30 ± 30		110 ± 90	970 ± 260	740 ± 210	
Grey River (above Ikamatua)		80 ± 50	80 ± 50	850 ± 270		150 ± 110	< 10	1160 ± 300	1400 ± 350	1660 ± 560
Grey River (below Ikamatua)		480 ± 220	790 ± 290	940 ± 210	130 ± 70		80 ± 60	2420 ± 430	4130 ± 540	1730 ± 240
Grey River Total		580 ± 220	1110 ± 320	2350 ± 400	170 ± 80	150 ± 110	210 ± 100	4550 ± 580	6270 ± 680	3390 ± 610
	Haupiri River		60 ± 30	300 ± 110			150 ± 110	500 ± 160	270 ± 110	140 ± 30
	Lady Lake	< 10						< 10	50 ± 40	
	Lake Ahaura	20 ± 20		90 ± 70		30 ± 30		140 ± 80	50 ± 30	30 ± 20
	Lake Brunner	920 ± 250	4370 ± 980	3120 ± 590	840 ± 450	90 ± 70	1100 ± 400	10430 ± 1320	9280 ± 910	4240 ± 550
	Lake Haupiri	20 ± 10	30 ± 30	110 ± 60				160 ± 70	240 ± 80	50 ± 30
	Lake Hochstetter	< 10	50 ± 40					60 ± 50	< 10	
	Lake Kangaroo								< 10	
	Lake Poerua	150 ± 60	180 ± 140	210 ± 110			210 ± 210	760 ± 280	370 ± 120	440 ± 180
	Little Grey (Mawheraiti) River	< 10	10 ± 10	150 ± 80				160 ± 80	480 ± 190	150 ± 50
	Molloy Creek	10 ± 10		120 ± 90				130 ± 90	70 ± 40	

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Moonlight Creek	80 ± 60		70 ± 60				150 ± 80	30 ± 20	20 ± 10
	Nelson Creek		20 ± 20					20 ± 20	120 ± 80	120 ± 60
	Orangipuku River			30 ± 30				30 ± 30	410 ± 170	110 ± 40
	Poerua River								150 ± 90	< 10
	Red Jacks Creek			30 ± 20				30 ± 20		
	Robinson River			< 10				< 10	160 ± 70	
	Rough River	150 ± 70	50 ± 30	350 ± 170	80 ± 80			640 ± 200	180 ± 60	200 ± 90
	Waikiti River		60 ± 60					60 ± 60		
	Burton Creek			30 ± 30				30 ± 30		
Total, Grey catchment		2220 ± 360	6800 ± 1060	8540 ± 880	1080 ± 460	490 ± 190	2080 ± 510	21220 ± 1590	21450 ± 1240	11940 ± 1050
Seven Mile Creek	Seven Mile Creek	20 ± 20	10 ± 10	20 ± 20				50 ± 30		
Ten Mile Creek	Ten Mile Creek	< 10						< 10		
Punakaiki River	Punakaiki River								30 ± 20	70 ± 30
Pororari River	Pororari River									50 ± 30
Fox River	Fox River			10 ± 10				10 ± 10	80 ± 60	20 ± 10
Waitakere River	Waitakere River	20 ± 20						20 ± 20		40 ± 30
Totara River	Totara River		120 ± 120					120 ± 120		
Okari River	Okari River	30 ± 30						30 ± 30		< 10
Buller River	Awarau (Larry's) River	60 ± 30	50 ± 20	510 ± 210	40 ± 40			660 ± 220	250 ± 70	120 ± 70
	Bradshaws Creek									20 ± 10
	Buller River (below Lyell)	330 ± 200	240 ± 160	280 ± 100	280 ± 160		210 ± 90	1330 ± 330		
	Inangahua River	40 ± 20	180 ± 120	810 ± 310			150 ± 90	1180 ± 340	1080 ± 220	790 ± 170
	Montgomerie River			30 ± 30				30 ± 30	< 10	20 ± 10
	New Creek			< 10				< 10		< 10

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Ohikaiti River			20 ± 20				20 ± 20		
	Ohikanui River		60 ± 40	250 ± 150				310 ± 150	50 ± 30	320 ± 100
	Stony (Te Wharau) River	< 10	< 10	120 ± 90				130 ± 90	40 ± 30	80 ± 40
	Trent River									< 10
	Waitahu River	20 ± 20	30 ± 20	120 ± 60	< 10		40 ± 40	210 ± 70	300 ± 70	110 ± 40
Total, Buller catchment		450 ± 200	570 ± 210	2130 ± 430	330 ± 160		400 ± 140	3880 ± 560	1730 ± 240	1470 ± 220
Orowaiti River	Orowaiti River									30 ± 10
Mokihinui River	Johnson River								20 ± 20	50 ± 40
	Mokihinui River	390 ± 340	280 ± 200	340 ± 130				1010 ± 410	400 ± 200	720 ± 160
Little Wanganui River	Little Wanganui River	80 ± 70	20 ± 20					100 ± 70	60 ± 30	20 ± 10
Karamea River	Beautiful River	50 ± 50		60 ± 60				110 ± 70	20 ± 20	
	Crow River		10 ± 10	190 ± 100			80 ± 80	280 ± 130		70 ± 40
	Karamea River	140 ± 60	330 ± 220	190 ± 100	20 ± 20	170 ± 170		830 ± 300	400 ± 170	920 ± 430
	Leslie River	20 ± 20	40 ± 20	140 ± 80			80 ± 80	280 ± 120	40 ± 20	50 ± 20
	Roaring Lion River		10 ± 10	50 ± 50				60 ± 60	90 ± 40	110 ± 70
	Ugly River			50 ± 50				50 ± 50		
Total, Karamea catchment		210 ± 80	390 ± 220	680 ± 190	20 ± 20	170 ± 170	160 ± 120	1620 ± 360	550 ± 180	1130 ± 430
Kohaihai River	Kohaihai River			30 ± 30				30 ± 30		
Heaphy River	Heaphy River			40 ± 30				40 ± 30	60 ± 50	20 ± 10
Total, all waters		**7410 ± 900**	**14320 ± 1320**	**19620 ± 1330**	**3150 ± 670**	**2240 ± 700**	**4540 ± 770**	**51270 ± 2410**	**34440 ± 1510**	**24400 ± 1410**

North Canterbury Region

Catchment	River (reach) / Lake	2007/2008 Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total	2001/2002 total	1994/1995 total
Waiau River	Ada River			30 ± 30				30 ± 30		20 ± 20
	Boyle River	10 ± 10	160 ± 130	230 ± 110				400 ± 170	200 ± 80	390 ± 270
	Doubtful River		110 ± 110	60 ± 60				170 ± 120	50 ± 40	
	Doubtless River		110 ± 110					110 ± 110		
	Hanmer River			30 ± 30				30 ± 30	30 ± 30	20 ± 20
	Henry River			30 ± 30				30 ± 30		
	Hope River	280 ± 150	30 ± 30	630 ± 300				940 ± 330	340 ± 110	510 ± 300
	Lake Guyon								160 ± 80	
	Lewis River			50 ± 40				50 ± 40	110 ± 50	270 ± 260
	Mason River								30 ± 30	
	Nina River	30 ± 30	150 ± 120	30 ± 30				200 ± 120	40 ± 20	260 ± 260
	Waiau River	410 ± 210	1770 ± 830	2040 ± 540	120 ± 120		10 ± 10	4340 ± 1020	2130 ± 420	1440 ± 490
Total, Waiau catchment		730 ± 260	2320 ± 860	3130 ± 630	120 ± 120		10 ± 10	6300 ± 1100	3080 ± 450	2920 ± 730
Hurunui River	Hurunui (unspecified)	220 ± 110	1410 ± 690	420 ± 130	280 ± 150		200 ± 120	2540 ± 730	1100 ± 370	17110 ± 3330
Hurunui River (above Mandamus)		710 ± 270	1560 ± 550	1690 ± 470	350 ± 210	90 ± 70		4400 ± 800	2910 ± 350	
Hurunui River (below Mandamus)		1130 ± 400	1960 ± 590	1920 ± 500	440 ± 300		210 ± 210	5660 ± 950	4370 ± 850	
Hurunui River Total		2060 ± 500	4940 ± 1060	4030 ± 700	1070 ± 400	90 ± 70	410 ± 240	12600 ± 1440	8380 ± 990	17110 ± 3330
	Lake Mason	80 ± 60	40 ± 40	140 ± 90	120 ± 90			380 ± 150	20 ± 20	300 ± 300
	Lake Sheppard	30 ± 30		210 ± 100				240 ± 100	120 ± 50	230 ± 120
	Lake Sumner	240 ± 170	760 ± 360	420 ± 180	130 ± 120	290 ± 240	60 ± 60	1910 ± 520	520 ± 210	390 ± 170
	Lake Taylor	330 ± 200	1110 ± 870	1070 ± 430	810 ± 810			3320 ± 1280	970 ± 220	750 ± 250
	Loch Katrine		160 ± 100	100 ± 100				260 ± 140	200 ± 70	190 ± 130
	Mandamus River	30 ± 30						30 ± 30		
	Sisters Sream			30 ± 30				30 ± 30		

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Waitohi River	20 ± 20			190 ± 190			220 ± 200		
Total, Hurunui catchment		2780 ± 570	7010 ± 1420	6000 ± 860	2320 ± 940	380 ± 250	470 ± 250	18970 ± 2020	10210 ± 1040	18970 ± 3360
Motunau River	Motunau River						280 ± 280	280 ± 280		20 ± 20
Waipara River	Waipara River	< 10	80 ± 80	850 ± 820				930 ± 820	80 ± 50	
Ashley River	Ashley River	2530 ± 1930	850 ± 240	1610 ± 450		60 ± 60	370 ± 270	5430 ± 2020	3520 ± 690	4530 ± 1050
	Glentui River									210 ± 120
	Okuku River	30 ± 30		150 ± 120				180 ± 120	30 ± 30	
	Saltwater Creek	20 ± 20	30 ± 30					50 ± 30	110 ± 100	
	Waikuku Stream								190 ± 190	
Waimakariri River	Broken River		160 ± 90	250 ± 120				410 ± 140	290 ± 100	680 ± 330
	Cam River	30 ± 30	60 ± 50	70 ± 70				160 ± 90	120 ± 80	1580 ± 1070
	Cass Hill Stream								50 ± 50	
	Courtenay Stream			140 ± 100				140 ± 100	< 10	
	Cust River	190 ± 190	260 ± 180	130 ± 110	180 ± 180			760 ± 340	40 ± 30	360 ± 190
	Esk River								90 ± 40	
	Eyre River									80 ± 50
	Kaiapoi Lakes		10 ± 10					10 ± 10	600 ± 360	
	Kaiapoi River	110 ± 110	890 ± 500	1560 ± 690	1130 ± 810	70 ± 70		3760 ± 1190	1800 ± 460	5250 ± 2150
	Kowai River								280 ± 170	10 ± 10
	Lake Grasmere	30 ± 20	290 ± 140	120 ± 60	< 10			450 ± 150	450 ± 110	820 ± 280
	Lake Hawdon		110 ± 60	40 ± 30	40 ± 40			190 ± 80	380 ± 120	180 ± 110
	Lake Letitia								70 ± 40	
	Lake Meremere		60 ± 60	160 ± 80				220 ± 110	340 ± 110	
	Lake Minchin									200 ± 190
	Lake Pearson	710 ± 300	1000 ± 310	690 ± 240	40 ± 40	140 ± 140	270 ± 170	2840 ± 540	2290 ± 350	1750 ± 630
	Lake Rotakahautu						140 ± 140	140 ± 140	320 ± 320	

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Lake Sarah		30 ± 30	60 ± 40				90 ± 40	270 ± 100	560 ± 190
	Minchin Stream								30 ± 20	
	Monopolies Pond								70 ± 70	
	Ohoka Stream								120 ± 110	
	Porter River	60 ± 60	100 ± 100	80 ± 60	40 ± 40			270 ± 140	170 ± 90	370 ± 270
	Poulter River			150 ± 80	230 ± 200			380 ± 210	80 ± 30	30 ± 30
	Silverstream		20 ± 20					20 ± 20	320 ± 150	1400 ± 620
	Slovens Stream			30 ± 30				30 ± 30		
	Styx River	< 10	290 ± 190	140 ± 130				440 ± 230	710 ± 320	440 ± 190
	The Groynes	200 ± 120	310 ± 160	130 ± 110				640 ± 230	440 ± 210	
	Waimakariri River	10930 ± 2760	25120 ± 3380	32940 ± 3960	4470 ± 1110	70 ± 60	1890 ± 930	75430 ± 6070	48950 ± 4260	58360 ± 7100
	Waimakariri S. Branch	20 ± 20			40 ± 40	500 ± 360		560 ± 360	290 ± 100	2560 ± 690
	Winding Creek								30 ± 30	
Total, Waimakariri catchment		12280 ± 2790	28720 ± 3450	36670 ± 4030	6180 ± 1400	780 ± 400	2300 ± 960	86930 ± 6250	58570 ± 4360	74620 ± 7600
Avon River	Avon River	150 ± 110	110 ± 110	140 ± 140		90 ± 90	70 ± 70	550 ± 240	730 ± 250	1020 ± 450
	Heathcote River								260 ± 160	30 ± 30
	Lake Bryndwyr								40 ± 40	300 ± 290
	Wairarapa Stream	110 ± 90		30 ± 30				140 ± 100		230 ± 140
Lake Forsyth	Lake Forsyth			220 ± 220				220 ± 220	330 ± 140	310 ± 170
	Okana River		710 ± 650	220 ± 220				920 ± 680	60 ± 40	520 ± 310
	Okuti River			220 ± 220				220 ± 220		
Kaituna River	Kaituna River									90 ± 90
Halswell River	Halswell River	20 ± 20	370 ± 170	70 ± 50				460 ± 180	220 ± 130	1760 ± 880
L II River	L II River	280 ± 180	120 ± 90	200 ± 140				600 ± 250	680 ± 290	2130 ± 1110
Selwyn River	Hawkins River								80 ± 50	210 ± 140
	Hororata River									160 ± 130

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Selwyn River	20 ± 20	250 ± 120	230 ± 120	500 ± 250			1000 ± 300	2130 ± 550	6700 ± 1370
Irwell River	Irwell River								40 ± 30	430 ± 240
Harts Creek	Harts Creek	30 ± 30	280 ± 240	240 ± 220	80 ± 80			630 ± 330	480 ± 120	1010 ± 520
Lake Ellesmere	Lake Ellesmere	40 ± 30	130 ± 70	30 ± 30				190 ± 80	150 ± 150	420 ± 280
Ellesmere to Rakaia	Tentburn Outfall			10 ± 10				10 ± 10	40 ± 40	2280 ± 1180
Rakaia River	Acheron River	40 ± 30	310 ± 240	480 ± 360				830 ± 430	560 ± 300	
	Avoca River			110 ± 70				110 ± 70	190 ± 80	
	Glenariffe Stream								190 ± 70	
	Harper River	30 ± 30	150 ± 90	130 ± 60				320 ± 120	190 ± 70	120 ± 120
	Hydra Waters				< 10			< 10	< 10	
	Lake Catherine		170 ± 70	170 ± 80				340 ± 110	250 ± 120	620 ± 350
	Lake Coleridge	3260 ± 870	4620 ± 930	3050 ± 680	400 ± 170	890 ± 390	1190 ± 480	13400 ± 1580	9170 ± 850	7090 ± 1310
	Lake Evelyn		130 ± 70	30 ± 30				160 ± 80	50 ± 40	
	Lake Georgina	600 ± 310	870 ± 320	510 ± 230	40 ± 40			2020 ± 510	660 ± 170	890 ± 280
	Lake Henrietta		190 ± 170	160 ± 130				350 ± 220		
	Lake Ida	60 ± 40	20 ± 20	120 ± 60				200 ± 70	740 ± 190	510 ± 480
	Lake Lilian		30 ± 30	10 ± 10				40 ± 30	30 ± 30	
	Lake Lyndon	390 ± 180	1800 ± 740	510 ± 190	< 10		110 ± 80	2820 ± 790	1970 ± 360	3290 ± 800
	Lake Selfe	30 ± 30	940 ± 530	500 ± 240	200 ± 190		260 ± 170	1920 ± 630	980 ± 200	600 ± 220
	Lake Stream	20 ± 20	20 ± 20	30 ± 30				60 ± 40	400 ± 250	
	Rakaia River	9350 ± 2110	21620 ± 3030	18710 ± 2320	2900 ± 800	70 ± 70	570 ± 250	53200 ± 4440	21460 ± 2040	34650 ± 3850
	Ryton River			30 ± 30				30 ± 30	50 ± 30	70 ± 70
	Wilberforce River		40 ± 40	220 ± 220				260 ± 220	50 ± 40	
Total, Rakaia catchment		13770 ± 2320	30910 ± 3330	24740 ± 2490	3550 ± 850	960 ± 390	2130 ± 580	76050 ± 4880	36930 ± 2300	47840 ± 4200
Total, all waters		**32800 ± 4160**	**71880 ± 5130**	**74740 ± 4980**	**12740 ± 1910**	**2270 ± 620**	**5630 ± 1210**	**200050 ± 8600**	**117930 ± 5170**	**166690 ± 9720**

Central South Island Region

Catchment	River (reach) / Lake	2007/2008 Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total	2001/2002 total	1994/1995 total
Rakaia River	Lake Heron	370 ± 160	1380 ± 360	530 ± 190	190 ± 100	270 ± 270		2740 ± 530	2580 ± 940	2620 ± 730
Wakanui Creek	Wakanui Creek								60 ± 60	
Ashburton River	Ashburton River	640 ± 270	1140 ± 350	690 ± 270	460 ± 390	160 ± 160	120 ± 120	3220 ± 680	5480 ± 1130	4170 ± 780
	Bowyers Stream		120 ± 110	50 ± 50				180 ± 120	280 ± 240	150 ± 130
	Lake Camp		220 ± 110	230 ± 130	40 ± 40			480 ± 180	470 ± 190	680 ± 190
	Lake Clearwater	570 ± 230	2100 ± 850	1340 ± 590	320 ± 180	430 ± 430	40 ± 40	4800 ± 1160	1480 ± 330	2900 ± 820
	Lake Donne			30 ± 30				30 ± 30		
	Lake Emily		60 ± 50	190 ± 110				250 ± 120	140 ± 50	20 ± 20
	Lake Emma	330 ± 180	320 ± 180	70 ± 40				720 ± 260	370 ± 140	440 ± 150
	Lake Hood	90 ± 60	60 ± 50	170 ± 150				310 ± 170		
	Lake Mystery		< 10					< 10		60 ± 60
	Lake Roundabout			30 ± 30				30 ± 30		50 ± 40
	Maori Lakes			50 ± 40				50 ± 40	220 ± 120	70 ± 30
	Spider Lakes			30 ± 30				30 ± 30		
	Taylors Stream			< 10				< 10	10 ± 10	
Total, Ashburton catchment		1620 ± 400	4030 ± 950	2880 ± 700	820 ± 430	590 ± 460	160 ± 130	10110 ± 1400	8450 ± 1230	8530 ± 1160
Hinds River	Hinds River								320 ± 170	210 ± 100
Rangitata River	Deep Creek	10 ± 10						10 ± 10	80 ± 80	20 ± 20
	Deep Stream		110 ± 110					110 ± 110	10 ± 10	190 ± 120
	Rangitata River	5790 ± 1540	15620 ± 2570	11180 ± 1880	730 ± 380		180 ± 130	33500 ± 3560	12710 ± 1930	35960 ± 2550
	RDR Canal		70 ± 50		40 ± 40			110 ± 60	960 ± 770	20 ± 20

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
Orari River	Coopers Creek								30 ± 30	
	Ohapi Creek	90 ± 70	100 ± 100					190 ± 120		120 ± 120
	Orari River	200 ± 110	100 ± 60	180 ± 110	80 ± 80		110 ± 110	650 ± 220	2310 ± 560	6330 ± 770
Opihi River	Hae Hae Te Moana River								10 ± 10	
	Kakahu River								20 ± 20	120 ± 110
	Lake Opuha	1140 ± 310	1120 ± 290	1390 ± 670	890 ± 710	380 ± 330	240 ± 240	5160 ± 1140	2670 ± 430	
	Opihi River	2840 ± 710	4290 ± 780	10920 ± 2260	1240 ± 810	50 ± 50	370 ± 230	19690 ± 2630	13390 ± 1660	18450 ± 1660
	Opuha River	240 ± 130	130 ± 60	430 ± 160			40 ± 40	840 ± 220	1310 ± 390	1500 ± 490
	Te Ngawai River	30 ± 30	100 ± 70	30 ± 30				150 ± 80	890 ± 390	90 ± 50
	Temuka River	320 ± 230	330 ± 140	320 ± 180				970 ± 320	970 ± 340	1280 ± 280
	Waihi River	90 ± 60	480 ± 310	110 ± 110				680 ± 340	690 ± 390	1670 ± 790
Total, Opihi catchment		4660 ± 820	6440 ± 910	13180 ± 2370	2130 ± 1080	420 ± 330	650 ± 340	27490 ± 2910	19960 ± 1870	23110 ± 1930
Pareora River	Pareora River	30 ± 30	280 ± 200	80 ± 80				390 ± 220	850 ± 290	190 ± 110
	Pareora River S. Branch	< 10						< 10		
Waimate Creek	Waimate Creek			290 ± 290				290 ± 290		20 ± 20
Waihao River	Waihao River	280 ± 260	160 ± 130		70 ± 50	70 ± 60	50 ± 40	640 ± 300	1100 ± 590	650 ± 290
	Waihao River N. Branch			270 ± 150		20 ± 20		290 ± 150		
	Waihao River S. Branch	100 ± 70	30 ± 30	170 ± 100				310 ± 130	10 ± 10	
Waitaki River	Ahuriri River	330 ± 140	2050 ± 550	1770 ± 350	180 ± 160		570 ± 250	4890 ± 720	2900 ± 580	2590 ± 720
	Andersons Creek		20 ± 20					20 ± 20		
	Avon Burn	70 ± 70						70 ± 70		20 ± 20
	Bell's Pond	10 ± 10		100 ± 70				110 ± 70	220 ± 170	
	Cass River		100 ± 70		< 10			100 ± 70	30 ± 20	

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Clear Stream		60 ± 50					60 ± 50		
	Coal River									20 ± 20
	Deep Stream		40 ± 40					40 ± 40		
	Dobson River	60 ± 40	610 ± 240	380 ± 190	200 ± 130			1250 ± 330	280 ± 130	
	Fork Stream			30 ± 30				30 ± 30		40 ± 30
	Fraser Stream		20 ± 20	110 ± 110				130 ± 110		
	Godley River	40 ± 40	30 ± 30	30 ± 30	150 ± 160			240 ± 160	120 ± 90	100 ± 80
	Grays River		210 ± 160	30 ± 30			70 ± 70	310 ± 180	260 ± 100	90 ± 60
	Hakataramea River	80 ± 50	650 ± 320	220 ± 110	310 ± 310			1260 ± 460	1610 ± 440	1920 ± 480
	Hen Burn		20 ± 20					20 ± 20		
	Hopkins River		400 ± 200	140 ± 60	50 ± 50			590 ± 220	130 ± 90	350 ± 230
	Huxley River		150 ± 130	30 ± 30				180 ± 130		260 ± 140
	Irishman Creek								30 ± 30	20 ± 20
	Jollie River								120 ± 90	
	Kelland Pond	140 ± 110	390 ± 380	20 ± 20				550 ± 400	770 ± 420	20 ± 20
	Kurow River					160 ± 160		160 ± 160	70 ± 40	270 ± 130
	Lake Alexandrina	870 ± 260	2220 ± 600	1810 ± 720	1220 ± 560	120 ± 80	120 ± 90	6350 ± 1120	9470 ± 1380	4480 ± 720
	Lake Aviemore	3520 ± 930	7010 ± 1430	5810 ± 1460	1770 ± 1550	20 ± 10	280 ± 190	18410 ± 2740	11580 ± 1490	8850 ± 1330
	Lake Benmore	8300 ± 1410	31260 ± 3530	12790 ± 1980	4480 ± 1310	630 ± 310	2300 ± 1000	59750 ± 4600	21740 ± 1680	12830 ± 1480
	Lake McGregor	120 ± 90	480 ± 230	190 ± 100				790 ± 260	590 ± 220	20 ± 20
	Lake Merino		20 ± 20					20 ± 20	70 ± 70	
	Lake Middleton		50 ± 30					50 ± 30	40 ± 30	880 ± 360
	Lake Ohau	840 ± 260	5650 ± 1390	1850 ± 950	590 ± 480		930 ± 480	9860 ± 1830	4630 ± 680	1520 ± 380

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Lake Poaka	50 ± 30	290 ± 130	450 ± 320			80 ± 80	870 ± 350	10 ± 10	
	Lake Pukaki	60 ± 60	800 ± 530		90 ± 80		80 ± 80	1030 ± 540	1100 ± 320	620 ± 190
	Lake Ruataniwha	260 ± 160	3640 ± 1450	470 ± 230	210 ± 140			4570 ± 1480	1700 ± 480	1030 ± 340
	Lake Tekapo	1510 ± 420	2630 ± 680	2530 ± 580	730 ± 370	80 ± 70	280 ± 140	7750 ± 1070	8730 ± 980	3000 ± 770
	Lake Waitaki	120 ± 90	1920 ± 700	740 ± 410	150 ± 150	50 ± 50	590 ± 340	3570 ± 900	3050 ± 880	5230 ± 1160
	Lake Wardell								30 ± 30	20 ± 20
	Larch Stream		50 ± 50					50 ± 50		100 ± 70
	Loch Cameron	30 ± 30	60 ± 40					90 ± 50	120 ± 90	
	Macaulay River		30 ± 30		80 ± 80			100 ± 80	140 ± 90	
	Maerewhenua River	180 ± 130	110 ± 60	210 ± 160			40 ± 40	540 ± 220	200 ± 90	470 ± 230
	Maitland Stream		30 ± 30					30 ± 30	90 ± 90	20 ± 20
	Mary Burn	50 ± 30	210 ± 160	160 ± 70				410 ± 180	200 ± 80	30 ± 20
	Ohau Canal	630 ± 270	3660 ± 1490	890 ± 410	380 ± 200		80 ± 80	5640 ± 1580	5370 ± 2060	1080 ± 630
	Ohau River	20 ± 20	300 ± 130	70 ± 40	80 ± 80		70 ± 70	530 ± 170	480 ± 150	640 ± 190
	Omarama Stream	20 ± 20	50 ± 30	110 ± 90			80 ± 80	260 ± 120	390 ± 290	490 ± 170
	Otamatapaio River								50 ± 50	
	Otematata River	140 ± 80	370 ± 200	90 ± 70	460 ± 460			1060 ± 520	180 ± 110	590 ± 210
	Parsons Rock Creek									50 ± 40
	Pukaki Canal	170 ± 170	340 ± 190	10 ± 10	150 ± 110		110 ± 110	790 ± 300	430 ± 400	
	Settlement Road Pond						40 ± 40	40 ± 40		
	Stony River								40 ± 40	
	Sutherlands Creek								50 ± 50	
	Tasman River		190 ± 160	150 ± 80				340 ± 180	< 10	

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Tekapo Canal	510 ± 210	2250 ± 1280	580 ± 270	990 ± 530	40 ± 30	70 ± 70	4440 ± 1430	7700 ± 950	870 ± 240
	Tekapo River	1140 ± 310	1060 ± 210	1220 ± 300	430 ± 200		610 ± 290	4460 ± 590	4910 ± 700	2420 ± 490
	Temple Stream			110 ± 50				110 ± 50		
	Twizel River	1040 ± 350	1120 ± 330	630 ± 210	30 ± 30	400 ± 250	610 ± 280	3820 ± 650	1250 ± 320	720 ± 360
Waitaki River (reach unspecified)		540 ± 170	1980 ± 1010	360 ± 160	1000 ± 790	220 ± 220	1060 ± 590	5160 ± 1450	1580 ± 480	34500 ± 3150
Waitaki River (Waitaki Dam to Kurow Bridge)		110 ± 50	1020 ± 370	1870 ± 750	600 ± 380			3600 ± 920	3600 ± 960	
Waitaki River (Kurow Bridge to stone wall/pylons)		140 ± 90	1780 ± 690	2100 ± 950	200 ± 140	1950 ± 1740		6170 ± 2110	4640 ± 760	
Waitaki River (Stone wall/pylons to SH1)		490 ± 200	1910 ± 670	1670 ± 620	120 ± 90			4180 ± 940	4650 ± 900	
Waitaki River(SH1 to tidal limit)		90 ± 90	530 ± 350	1930 ± 970		< 10		2560 ± 1040	2330 ± 390	
Waitaki River (Mouth and tidal zone)		710 ± 440	1230 ± 480	4900 ± 1680			70 ± 70	6910 ± 1800	10770 ± 2070	
Waitaki River Total		2070 ± 530	8470 ± 1560	12820 ± 2380	1910 ± 890	2170 ± 1760	1130 ± 600	27800 ± 3470	28570 ± 2640	34500 ± 3150
	Whale Stream		10 ± 10					10 ± 10		
Total, Waitaki catchment		22360 ± 1980	78970 ± 5240	46500 ± 3790	14650 ± 2520	3670 ± 1810	8130 ± 1430	174280 ± 7540	118460 ± 4830	86130 ± 4310
Kakanui River	Kakanui River	190 ± 140	660 ± 350	50 ± 50				890 ± 380	220 ± 110	2040 ± 650
	Kauru River			180 ± 180				180 ± 180		
Waianakarua River	Waianakarua River								140 ± 140	
Total, all waters		**35720 ± 2700**	**107950 ± 6010**	**75490 ± 4930**	**18710 ± 2700**	**5050 ± 1920**	**9280 ± 1490**	**252190 ± 9020**	**168230 ± 5860**	**166140 ± 5640**

Otago Region

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
Shag River	Shag River	120 ± 90	220 ± 110	120 ± 70	290 ± 210		60 ± 60	800 ± 270	890 ± 310	1060 ± 290
Waikouaiti River	Waikouaiti River		940 ± 550			70 ± 70	220 ± 160	1240 ± 580	1360 ± 850	2630 ± 700
Waitati River	Waitati River	440 ± 370		110 ± 110			460 ± 460	1010 ± 600	130 ± 80	670 ± 300
Water of Leith	Northern Reservoir									30 ± 30
	Sullivans Dam	10 ± 20	180 ± 110	410 ± 260		510 ± 440	120 ± 90	1230 ± 530	2030 ± 540	420 ± 190
	Water of Leith						200 ± 200	200 ± 200	60 ± 50	
Tomahawk Creek	Tomahawk Creek	40 ± 40	280 ± 180					320 ± 190		
	Tomahawk Lagoon								670 ± 370	
Kaikorai Stream	Southern Reservoir	220 ± 140		150 ± 150			670 ± 630	1030 ± 660	1100 ± 410	430 ± 240
Taieri River	Blakeleys Dam		180 ± 110	30 ± 30				210 ± 110	280 ± 140	730 ± 330
	Coal Pit Dam		20 ± 20	80 ± 60				100 ± 60	760 ± 260	460 ± 240
	Deep Stream		210 ± 130					210 ± 130	340 ± 200	190 ± 140
	Hamiltons Dam									40 ± 40
	Hoffmans Dam								280 ± 130	30 ± 30
	Hore's Pond		330 ± 330					330 ± 330	40 ± 40	
	Knights Dam								70 ± 70	30 ± 30
	Kye Burn	180 ± 150	150 ± 130					340 ± 200	100 ± 80	
	Lake Mahinerangi	440 ± 200	800 ± 440	800 ± 350	60 ± 60	70 ± 70		2160 ± 600	4750 ± 1090	4130 ± 690
	Lake Waihola		50 ± 50	180 ± 180			70 ± 70	300 ± 200	1640 ± 620	310 ± 210
	Lake Waipori		< 10	10 ± 10				20 ± 20		120 ± 90
	Lee Stream	90 ± 90	30 ± 30	40 ± 30				150 ± 100	60 ± 40	170 ± 90

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Logan Burn			30 ± 30				30 ± 30		
	Logan Burn Reservoir	450 ± 320	1440 ± 400	760 ± 260	220 ± 170			2870 ± 600	4280 ± 860	1320 ± 340
	Lone Pine Dam									20 ± 20
	Mathias Dam		50 ± 50					50 ± 50	200 ± 100	340 ± 160
	McAtamneys Head Pond		280 ± 260					280 ± 260		
	Meggat Burn								50 ± 50	
	Rutherfords Dam		30 ± 30					30 ± 30	130 ± 70	190 ± 120
	Silver Stream		240 ± 220					240 ± 220	20 ± 20	
	Sutton Creek								80 ± 70	150 ± 80
Taieri River (reach unspecified)		510 ± 380	1230 ± 580	70 ± 40	160 ± 90			1970 ± 700	1140 ± 500	11530 ± 1280
Taieri River (above Kokonga)		740 ± 280	980 ± 340	1720 ± 970	240 ± 220	290 ± 290	80 ± 80	4050 ± 1130	3660 ± 730	
Taieri River (Kokonga to Outram Bridge)		290 ± 230	370 ± 150	2070 ± 1230				2730 ± 1260	1050 ± 270	
Taieri River (Outram Bridge to Taieri Mouth)		770 ± 470	1220 ± 570	1690 ± 850	1650 ± 1650	100 ± 80	2200 ± 1260	7610 ± 2360	13230 ± 2470	
Taieri River Total		2300 ± 700	3790 ± 890	5560 ± 1780	2040 ± 1670	390 ± 300	2280 ± 1270	16360 ± 2990	19080 ± 2640	11530 ± 1280
	Three O'Clock Stream								< 10	
	Waipori River		140 ± 110					140 ± 110	720 ± 270	320 ± 160
	West Eweburn Dam		610 ± 610			30 ± 20		640 ± 610		30 ± 30
Total, Taieri catchment		3460 ± 810	8350 ± 1340	7490 ± 1840	2320 ± 1680	490 ± 310	2350 ± 1270	24450 ± 3220	32860 ± 3090	20090 ± 1590
Tokomairiro River	Tokomairiro River	110 ± 110	110 ± 80	300 ± 300				520 ± 330	4090 ± 1680	850 ± 270
Clutha River	Albert Burn									30 ± 20
	Arrow River	120 ± 100	130 ± 100	90 ± 90				350 ± 160		210 ± 120
	Bannock Burn									190 ± 120
	Blue River			80 ± 60				80 ± 60	20 ± 20	20 ± 20

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Boundary Creek								80 ± 80	
	Butchers Dam		50 ± 40	570 ± 320				620 ± 330	200 ± 90	170 ± 90
	Camp Creek								80 ± 80	
	Caples River	20 ± 20	260 ± 140	240 ± 130			160 ± 160	680 ± 250	230 ± 120	190 ± 100
	Cardrona River		30 ± 30					30 ± 30		30 ± 30
	Cluden Stream									40 ± 40
Clutha River (reach unspecified)		1410 ± 620	1740 ± 740	880 ± 350	20 ± 20	150 ± 150	970 ± 500	5150 ± 1150	2710 ± 990	
Clutha River (Wanaka to Lake Dunstan)		5980 ± 2610	8110 ± 1400	4800 ± 840	1480 ± 620	120 ± 80	1530 ± 780	22030 ± 3240	20160 ± 2760	11440 ± 2140
Clutha River (below Roxburgh)		2250 ± 820	5320 ± 1370	2790 ± 790	980 ± 600	500 ± 320	700 ± 340	12550 ± 1940	14450 ± 2950	14890 ± 2390
Clutha River Total		9640 ± 2810	15170 ± 2090	8470 ± 1210	2480 ± 860	770 ± 360	3200 ± 990	39730 ± 3950	37320 ± 4160	26340 ± 3210
	Conroys Dam		130 ± 110	100 ± 90	170 ± 170			400 ± 220	80 ± 50	60 ± 40
	Dart River		20 ± 20	10 ± 10	20 ± 20	10 ± 10	150 ± 150	200 ± 150	40 ± 40	90 ± 50
	Diamond Creek	190 ± 180	150 ± 150	160 ± 70			80 ± 60	580 ± 260	380 ± 160	30 ± 20
	Diamond Lake	40 ± 40	250 ± 120	150 ± 70	40 ± 40			470 ± 150	520 ± 210	330 ± 170
	Dingle Burn		10 ± 10	80 ± 60				90 ± 60	110 ± 80	120 ± 60
	Dunstan Creek	70 ± 70	150 ± 160	140 ± 100				360 ± 200	40 ± 40	160 ± 140
	Falls Dam		90 ± 60	110 ± 60				190 ± 90	130 ± 80	30 ± 30
	Fast Burn								210 ± 210	
	Fraser Dam		40 ± 40	80 ± 70			150 ± 150	270 ± 170	90 ± 70	60 ± 50
	Fraser River	340 ± 210	700 ± 340	350 ± 340				1380 ± 520	530 ± 390	410 ± 150
	Glenorchy Lagoons		100 ± 100					100 ± 100		
	Greenstone River	40 ± 40	350 ± 140	240 ± 160			80 ± 80	710 ± 230	370 ± 170	460 ± 160
	Hawea River	120 ± 80	510 ± 300	140 ± 80	20 ± 20	10 ± 10	40 ± 40	830 ± 320	4970 ± 1310	1920 ± 470

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Hunter River	160 ± 120	680 ± 290	220 ± 140	40 ± 40		120 ± 90	1230 ± 360	1630 ± 580	610 ± 170
	Ida Burn		50 ± 50	150 ± 150				200 ± 160		
	Kaihiku Stream									20 ± 20
	Kaitangata Channel						40 ± 40	40 ± 40		30 ± 30
	Kaiwera Stream		260 ± 260					260 ± 260	70 ± 70	100 ± 70
	Kawarau River	70 ± 70	1350 ± 670	510 ± 330				1930 ± 750	1700 ± 770	3510 ± 1010
	Lake Dispute		80 ± 80					80 ± 80		
	Lake Dunstan	6110 ± 1260	11940 ± 2020	4740 ± 1110	2580 ± 930	80 ± 70	680 ± 310	26140 ± 2800	19480 ± 2910	22250 ± 1750
	Lake Hawea	3570 ± 910	12290 ± 2280	2870 ± 540	1920 ± 830	160 ± 150	1410 ± 740	22210 ± 2750	28160 ± 3670	18820 ± 2260
	Lake Hayes	40 ± 40	360 ± 140	160 ± 90				560 ± 170	1540 ± 830	1430 ± 480
	Lake Johnson	150 ± 100	30 ± 30					170 ± 110	80 ± 80	
	Lake Kirkpatrick			30 ± 30				30 ± 30	70 ± 70	500 ± 300
	Lake Luna									40 ± 40
	Lake Onslow	480 ± 230	1860 ± 650	1020 ± 400	60 ± 60			3420 ± 800	3450 ± 570	2720 ± 490
	Lake Reid			50 ± 50				50 ± 50		
	Lake Rere								< 10	
	Lake Roxburgh	730 ± 420	1100 ± 440	1170 ± 970	90 ± 90			3080 ± 1150	210 ± 90	50 ± 40
	Lake Sylvan	180 ± 180						180 ± 180		
	Lake Tuakitoto	220 ± 220						220 ± 220		
	Lake Wakatipu	4090 ± 1180	10430 ± 1480	4530 ± 960	970 ± 500	490 ± 230	970 ± 440	21480 ± 2240	17720 ± 1910	21410 ± 2180
	Lake Wanaka	8180 ± 4660	20630 ± 2870	7330 ± 1250	2690 ± 1070	170 ± 130	410 ± 220	39400 ± 5720	25270 ± 2310	25530 ± 2370
	Lindis River		330 ± 220					330 ± 220	150 ± 90	280 ± 100
	Lochy River	40 ± 40	40 ± 30	60 ± 40			120 ± 90	260 ± 110	260 ± 170	130 ± 70

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Makarora River	230 ± 150	970 ± 360	310 ± 130	170 ± 170		200 ± 120	1870 ± 460	1480 ± 410	1460 ± 350
	Malones Dam	230 ± 220						230 ± 220		
	Manor Burn		20 ± 20				150 ± 150	160 ± 150	440 ± 210	220 ± 90
	Manorburn Reservoir	1090 ± 340	1490 ± 460	670 ± 210	160 ± 120			3410 ± 620	2350 ± 540	510 ± 130
	Manuherikia River	400 ± 240	1350 ± 580	100 ± 70		60 ± 60	160 ± 110	2070 ± 650	5630 ± 2060	3570 ± 840
	Matukituki River		100 ± 60	80 ± 60	110 ± 110		200 ± 120	490 ± 180	530 ± 280	870 ± 240
	Minaret Burn			30 ± 30				30 ± 30		50 ± 30
	Moke Lake	110 ± 80	260 ± 170	250 ± 140			200 ± 150	820 ± 270	1530 ± 430	370 ± 170
	Mototapu River		130 ± 80					130 ± 80	20 ± 20	150 ± 90
	Nevis River	70 ± 50	490 ± 200	280 ± 100			40 ± 40	880 ± 240	250 ± 80	110 ± 70
	Phoenix Dam	70 ± 70	20 ± 20					90 ± 80		
	Pomahaka River	820 ± 350	1170 ± 450	1640 ± 780	310 ± 190		210 ± 130	4140 ± 1000	6000 ± 1440	6780 ± 1210
	Pool Burn		30 ± 20		20 ± 20			50 ± 30	370 ± 140	
	Poolburn Reservoir	1020 ± 320	1380 ± 420	930 ± 320	220 ± 160	290 ± 290		3840 ± 700	2810 ± 600	2280 ± 540
	Puerua River		260 ± 260	40 ± 40				300 ± 260	90 ± 70	
	Rees River		80 ± 80	60 ± 40			40 ± 40	180 ± 100	130 ± 90	290 ± 200
	Route Burn	180 ± 180	100 ± 80	420 ± 220			120 ± 90	820 ± 310	90 ± 60	
	Shotover River		50 ± 50	30 ± 30	20 ± 20			90 ± 60	1120 ± 500	130 ± 60
	Staircase Creek		30 ± 30					30 ± 30		80 ± 80
	Steele Creek			30 ± 30				30 ± 30		
	Temple Burn		50 ± 50					50 ± 50	80 ± 50	40 ± 30
	Teviot River		100 ± 80					100 ± 80	330 ± 200	160 ± 70
	Timaru River	< 10	10 ± 10	50 ± 40			80 ± 60	160 ± 70	480 ± 150	170 ± 60

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Tuapeka River	70 ± 70	30 ± 30					100 ± 80	110 ± 100	90 ± 60
	Twelve Mile Creek		40 ± 40					40 ± 40		20 ± 20
	Von River	410 ± 300	260 ± 210	160 ± 70			40 ± 40	870 ± 370	520 ± 190	190 ± 90
	Waikerikeri Creek		80 ± 80					80 ± 80		30 ± 20
	Waikoikoi Creek		50 ± 50					50 ± 50	340 ± 310	
	Waipahi River	130 ± 60	580 ± 380	130 ± 90			80 ± 80	920 ± 410	1820 ± 490	2370 ± 630
	Waitahuna River	390 ± 140		30 ± 30				420 ± 140	880 ± 460	10 ± 10
	Waiwera River		10 ± 10	110 ± 80				120 ± 80	320 ± 250	110 ± 100
	Wilkin River		180 ± 100	190 ± 100			40 ± 40	410 ± 150	150 ± 90	200 ± 120
	Wye Creek	80 ± 80					70 ± 70	160 ± 110		520 ± 210
	Young River		20 ± 20					20 ± 20	120 ± 100	30 ± 20
Total, Clutha catchment		39920 ± 5870	88850 ± 5210	39380 ± 2820	12050 ± 1960	2040 ± 560	9230 ± 1450	191480 ± 8710	173150 ± 7800	149110 ± 5840
Catlins River	Catlins River	580 ± 430	690 ± 570	220 ± 120				1490 ± 720	910 ± 330	4510 ± 1520
	Owaka River	40 ± 40	100 ± 100	610 ± 410	330 ± 330			1090 ± 530	190 ± 120	1400 ± 1100
Tahakopa River	Maclennan River								150 ± 140	10 ± 10
	Tahakopa River		30 ± 30	30 ± 30				60 ± 40	720 ± 380	1630 ± 940
Tautuku River	Fleming River								20 ± 20	
	Tautuku River	30 ± 30						30 ± 30	390 ± 230	60 ± 40
Total, all waters		**44970 ± 5960**	**99740 ± 5450**	**48830 ± 3420**	**14990 ± 2610**	**3110 ± 780**	**13310 ± 2090**	**224940 ± 9410**	**218710 ± 8660**	**182870 ± 6470**

Southland Region

Catchment	River (reach) / Lake	2007/2008 Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total	2001/2002 total	1994/1995 total
Waikawa River	Waikawa River	620 ± 290	330 ± 220	140 ± 100				1090 ± 380	930 ± 400	1030 ± 440
Waikopikopiko Stm.	Waikopikopiko Stream		140 ± 140					140 ± 140		
Tokanui River	Tokanui River		140 ± 110					140 ± 110		
Titiroa Stream	Titiroa Stream	30 ± 30	50 ± 50				750 ± 750	830 ± 760	80 ± 80	
Mataura River	Argyle Burn	10 ± 10		30 ± 30				40 ± 30		20 ± 20
	Dome Burn			30 ± 30				30 ± 30	20 ± 20	< 10
	Eyre Creek			60 ± 60				60 ± 60	50 ± 40	210 ± 200
	Fortune Creek									40 ± 30
	Gow Burn	350 ± 350						350 ± 350		40 ± 40
Mataura River (reach unspecified)		770 ± 320	800 ± 280	5120 ± 1080	180 ± 130		360 ± 190	7240 ± 1180	300 ± 90	51360 ± 3260
Mataura River (above Gore)		3270 ± 840	5410 ± 1030	3870 ± 810	540 ± 350	110 ± 90	470 ± 250	13670 ± 1620	15810 ± 1800	
Mataura River (below Gore)		6380 ± 1440	4630 ± 1020	3500 ± 820	4290 ± 2240	190 ± 120	380 ± 380	19360 ± 2990	36850 ± 3510	
Mataura River Total		10420 ± 1700	10840 ± 1480	12490 ± 1580	5000 ± 2270	310 ± 140	1210 ± 490	40260 ± 3600	52960 ± 3950	51360 ± 3260
	Mimihau Stream	30 ± 30	80 ± 40					110 ± 50	1540 ± 540	900 ± 290
	Mokoreta River	240 ± 120	330 ± 260	380 ± 350				950 ± 450	1090 ± 300	2390 ± 460
	Muddy Creek								20 ± 20	
	Nokomai River	50 ± 40	60 ± 60	70 ± 50	180 ± 180			370 ± 200	380 ± 270	760 ± 530
	Otamita Stream	210 ± 140	270 ± 250	30 ± 30				500 ± 290	840 ± 260	1370 ± 590
	Pukerau Stream									20 ± 20
	Redan Stream									10 ± 10
	Robert Creek	40 ± 40		50 ± 50				90 ± 70		

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Steeple Burn									20 ± 20
	Tomogalak Stream			10 ± 10				10 ± 10	10 ± 10	70 ± 40
	Waikaia River	1770 ± 610	1340 ± 420	1280 ± 280	60 ± 60	< 10		4460 ± 800	6850 ± 1190	6810 ± 1030
	Waikaka Stream	60 ± 40	470 ± 290	280 ± 160				810 ± 330	1750 ± 680	980 ± 240
	Waimea Stream	240 ± 210		150 ± 100	20 ± 20			420 ± 230	680 ± 320	150 ± 60
	Winding Creek			30 ± 30				30 ± 30		
Total, Mataura catchment		13410 ± 1860	13390 ± 1600	14900 ± 1650	5270 ± 2280	320 ± 140	1210 ± 490	48490 ± 3770	66190 ± 4250	65150 ± 3570
Waituna Lagoon	Waituna Lagoon	560 ± 220	300 ± 150	670 ± 240	310 ± 200			1840 ± 410	1220 ± 550	1130 ± 320
Waihopai River	Waihopai River	220 ± 160	160 ± 130					370 ± 210	200 ± 200	
Oreti River	Acton Stream								180 ± 120	20 ± 10
	Cromel Stream	70 ± 70	200 ± 200	10 ± 10				290 ± 220	30 ± 30	
	Dipton Stream		80 ± 80	30 ± 30				110 ± 80		180 ± 100
	Dunsdale Stream	30 ± 30	90 ± 60	220 ± 220				330 ± 230	230 ± 110	360 ± 210
	Hedgehope Stream		80 ± 50	240 ± 220				320 ± 220	290 ± 160	10 ± 10
	Irthing Stream								200 ± 110	90 ± 50
	Lora Stream								80 ± 40	100 ± 60
	Makarewa River	530 ± 220	390 ± 270	340 ± 200	550 ± 550	70 ± 70	80 ± 80	1940 ± 690	1910 ± 610	3610 ± 670
	Murray Creek								30 ± 30	
Oreti River (reach unspecified)		340 ± 190	710 ± 310	2050 ± 520	150 ± 120	40 ± 40		3290 ± 650	340 ± 140	27180 ± 2300
Oreti River(above Lumsden)		1670 ± 710	1230 ± 420	1230 ± 280	220 ± 140		890 ± 640	5230 ± 1090	2700 ± 800	
Oreti River(below Lumsden)		5140 ± 870	3060 ± 770	2700 ± 590	880 ± 450	420 ± 260	1120 ± 780	13330 ± 1600	17590 ± 1950	
Oreti River Total		7150 ± 1140	5000 ± 930	5980 ± 840	1250 ± 490	460 ± 260	2010 ± 1010	21850 ± 2040	20630 ± 2120	27180 ± 2300
	Otapiri Stream	80 ± 60	120 ± 90	60 ± 40				250 ± 110	990 ± 260	950 ± 220

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Waikiwi Stream	160 ± 160	250 ± 250					410 ± 300		130 ± 80
	Weydon Burn								70 ± 70	10 ± 10
	Windley River								70 ± 60	
Total, Oreti catchment		8020 ± 1170	6200 ± 1030	6880 ± 910	1800 ± 740	530 ± 270	2090 ± 1010	25510 ± 2220	24690 ± 2230	32650 ± 2420
Waimatuku Stream	Waimatuku Stream	70 ± 40						70 ± 40	490 ± 250	1420 ± 410
Aparima River	Aparima River	3880 ± 870	1250 ± 290	1870 ± 550	220 ± 160	270 ± 240	250 ± 180	7730 ± 1120	6750 ± 970	11280 ± 1440
	Braxton Burn	40 ± 40						40 ± 40		
	Etal Stream									30 ± 20
	Hamilton Burn	90 ± 50	170 ± 130	340 ± 140				600 ± 200	1040 ± 380	190 ± 80
	Omutu Creek		30 ± 30					30 ± 30		
	Otautau Stream	200 ± 190	180 ± 180	10 ± 10				400 ± 260	300 ± 210	50 ± 50
	Pourakino River						30 ± 30	30 ± 30	230 ± 170	480 ± 220
Total, Aparima catchment		4210 ± 890	1620 ± 370	2220 ± 570	220 ± 160	270 ± 240	280 ± 190	8820 ± 1170	8300 ± 1080	12030 ± 1460
Waiau River	Awe Burn			30 ± 30				30 ± 30	360 ± 360	
	Borland Burn		190 ± 190	30 ± 30				220 ± 190	60 ± 30	60 ± 30
	Clinton River		10 ± 10	200 ± 140				210 ± 140	50 ± 30	660 ± 320
	Doon River			< 10				< 10	20 ± 20	60 ± 50
	Eglinton River	70 ± 70	40 ± 30	420 ± 120			200 ± 120	730 ± 190	1020 ± 400	670 ± 200
	Eglinton River E. Branch			30 ± 30				30 ± 30		
	Electric River	40 ± 40		30 ± 30				70 ± 50	400 ± 370	20 ± 20
	Flaxy Creek	40 ± 40						40 ± 40		
	Freeman Burn								320 ± 310	
	Glaisnock River			10 ± 10				10 ± 10	20 ± 20	50 ± 30

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Grebe River	260 ± 200		100 ± 70				350 ± 210	320 ± 310	110 ± 60
	Green Lake			20 ± 20	40 ± 40			60 ± 50	< 10	
	Home Creek								20 ± 10	
	Iris Burn									60 ± 50
	Island Lake								< 10	
	Junction Burn								20 ± 20	30 ± 20
	Kiwi Burn								10 ± 10	
	Lake Fergus								50 ± 50	
	Lake Gunn		170 ± 120			80 ± 80		240 ± 140	120 ± 80	40 ± 20
	Lake Hankinson									10 ± 10
	Lake Henry			10 ± 10		30 ± 30		40 ± 30	90 ± 70	
	Lake Manapouri	1140 ± 360	3440 ± 850	1910 ± 500	880 ± 450	310 ± 210	150 ± 120	7830 ± 1170	5920 ± 940	5490 ± 870
	Lake Monowai	380 ± 160	1410 ± 470	760 ± 210	300 ± 160	350 ± 280	110 ± 110	3330 ± 640	6250 ± 1120	4030 ± 580
	Lake Te Anau	3490 ± 1670	10130 ± 1650	4950 ± 950	1190 ± 420	1410 ± 530	190 ± 160	21350 ± 2620	12080 ± 1910	10280 ± 1230
	Lake Thomas	30 ± 30						30 ± 30	390 ± 160	130 ± 50
	Letham Burn								120 ± 70	20 ± 20
	Lill Burn		20 ± 20					20 ± 20	80 ± 50	120 ± 70
	Lugar Burn	40 ± 40		30 ± 30				70 ± 50	< 10	
	Mararoa River	200 ± 80	870 ± 300	750 ± 160	60 ± 60	40 ± 40		1930 ± 350	2970 ± 590	2230 ± 380
	McKenzie Burn	110 ± 110		30 ± 30				140 ± 110	50 ± 50	
	Monowai River	60 ± 40	180 ± 160	60 ± 50				310 ± 170	690 ± 350	440 ± 160
	Morley Stream	140 ± 140						140 ± 140	50 ± 40	30 ± 20
	North Mavora Lake	290 ± 100	2380 ± 1320	920 ± 300				3590 ± 1350	2760 ± 580	1420 ± 290

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Nurse Creek				90 ± 90			90 ± 90		
	Orauea River	80 ± 60		10 ± 10				90 ± 60	690 ± 290	760 ± 340
	Princhester Creek	< 10						< 10	40 ± 40	
	Snag Burn	10 ± 10	150 ± 150					170 ± 150		20 ± 20
	South Mavora Lake			580 ± 410	90 ± 70		150 ± 150	820 ± 440	1130 ± 300	690 ± 140
	Spey River								400 ± 300	50 ± 40
	Upukerora River	170 ± 90	370 ± 170	680 ± 200	360 ± 270		480 ± 230	2070 ± 450	1190 ± 370	630 ± 180
Waiau River (unspecified)		250 ± 100	1800 ± 700	2020 ± 910	60 ± 60			4130 ± 1160	850 ± 320	7720 ± 840
Waiau River (Te Anau to Manapouri)		1490 ± 480	3660 ± 970	1400 ± 320	920 ± 380	130 ± 140	160 ± 110	7760 ± 1200	5920 ± 1120	
Waiau River(below Mararoa)		2880 ± 950	1430 ± 440	840 ± 210	330 ± 150	40 ± 40	1130 ± 1130	6650 ± 1570	7890 ± 940	
Waiau River Total		4620 ± 1070	6880 ± 1280	4260 ± 990	1310 ± 410	170 ± 140	1290 ± 1140	18540 ± 2290	14660 ± 1500	7720 ± 840
	Wairaki River	380 ± 220	270 ± 200	100 ± 50	30 ± 30			790 ± 300	460 ± 210	220 ± 70
	Walker River								30 ± 30	
	Wapiti River								10 ± 10	340 ± 250
	Whitestone River	220 ± 100	520 ± 260	300 ± 120	360 ± 280		200 ± 170	1600 ± 450	470 ± 130	710 ± 350
	Windon Burn	70 ± 40		50 ± 50				120 ± 70	20 ± 20	70 ± 70
	Worsley Stream	40 ± 30	30 ± 30	70 ± 40				130 ± 60	100 ± 80	800 ± 300
Total, Waiau catchment		11860 ± 2060	27070 ± 2710	16360 ± 1600	4710 ± 870	2390 ± 660	2780 ± 1210	65170 ± 4100	53490 ± 3160	37940 ± 2050
Wairaurahiri River	Lake Hauroko	90 ± 50	50 ± 40	30 ± 30				160 ± 80	320 ± 140	130 ± 60
	Wairaurahiri River		90 ± 90					90 ± 90	20 ± 20	
Big River	Lake Monk	< 10	110 ± 80					110 ± 80	50 ± 50	
Dusky Sound	Seaforth River		30 ± 30					30 ± 30	< 10	
Sutherland Sound	Dark River								70 ± 70	

Catchment	River (reach) / Lake	2007/2008							2001/2002 total	1994/1995 total
		Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Total		
	Light River								70 ± 70	
Arthur River	Arthur River			60 ± 60				60 ± 60	20 ± 10	170 ± 150
	Joe's River			50 ± 40				50 ± 40		
	Lake Ada				30 ± 30			30 ± 30		
Cleddau River	Cleddau River			50 ± 40				50 ± 40		90 ± 70
Hollyford River	Hidden Falls Creek								30 ± 30	
	Hollyford River	< 10	90 ± 50	130 ± 80		80 ± 80	120 ± 120	430 ± 170	190 ± 120	600 ± 280
	Lake Alabaster	40 ± 30	60 ± 50	10 ± 10				110 ± 60	40 ± 30	30 ± 20
	Lake Mackenzie			30 ± 30				30 ± 30		
	Lake McKerrow								440 ± 380	360 ± 220
	Lake Wilmot	30 ± 30						30 ± 30	10 ± 10	
	Pyke River	30 ± 30	30 ± 30	20 ± 20				70 ± 40	210 ± 150	100 ± 80
Total, Hollyford catchment		90 ± 50	170 ± 80	190 ± 90		80 ± 80	120 ± 120	660 ± 190	920 ± 430	1080 ± 370
Total, all waters		**39180 ± 3170**	**49830 ± 3360**	**41550 ± 2560**	**12330 ± 2560**	**3590 ± 770**	**7230 ± 1830**	**153710 ± 6190**	**157060 ± 5920**	**152820 ± 5050**