

**BEFORE THE INDEPENDENT COMMISSIONERS**

**IN THE MATTER** of the Resource Management Act  
1991

**AND**

**IN THE MATTER** of the Proposed Canterbury Land  
and Water Regional Plan

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**EVIDENCE IN CHIEF OF NEIL ALASTAIR DEANS ON BEHALF OF  
NELSON/MARLBOROUGH, NORTH CANTERBURY AND CENTRAL  
SOUTH ISLAND FISH AND GAME COUNCILS**

**4 FEBRUARY 2013**

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**ANDERSON LLOYD**  
LAWYERS  
DUNEDIN

Solicitor: Maree Baker-Galloway

Level 10, Otago House  
Cnr Moray & Princes Street,  
Private Bag 1959,  
DUNEDIN 9054  
Tel 03 477 3973  
Fax 03 477 3184

## QUALIFICATIONS AND EXPERIENCE

1. My name is Neil Alastair Deans. I am the Manager of the Nelson Marlborough Fish and Game Council ("NMFGC") and have since 2005 undertaken a part-time role as National Resource Management Coordinator for the New Zealand Fish and Game Council ("NZFGC").
  
2. I completed a Bachelor of Science with Honours in Zoology from the University of Canterbury in 1982 and a Diploma of Parks and Recreation Management with Distinction from Lincoln College in 1985. I have worked for the New Zealand Wildlife Service, New Zealand Forest Service, Lands and Survey Department and Department of Conservation ("DoC") in a variety of roles in the recreation, conservation and environmental impact assessment fields in a variety of locations throughout the country during the 1980s. I was based in Hamilton from 1986 to 1990. I moved to Nelson in 1990 to take up a position with DoC as their Senior Conservation Officer for Freshwater and Ecological Survey for the Nelson Marlborough Conservancy, which I held until taking up my present position in 1994.
  
3. I have undertaken environmental impact assessment and ecological surveys in locations from Northland to Stewart Island and have organised and contributed to recreational and user surveys in a number of locations. I have written or co-authored 14 peer-reviewed papers; more than 30 reports, evidential statements or book chapters and presented more than 30 papers or presentations to conferences and seminars on general or specific aspects of freshwater management, including specifically on Sports Fishery Management in New Zealand<sup>1</sup>.
  
4. I am a member of the Royal Society of NZ, New Zealand Ecological Society, and was President of the New Zealand Freshwater Sciences

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<sup>1</sup> Deans, NA; MJ Unwin and M Rodway (2004) **Sport Fishery Management** Chapter 41 in 'Freshwaters of New Zealand' Jointly published by the New Zealand Hydrological Society and New Zealand Limnological Society.

Society (formerly New Zealand Limnological Society) for 4 years. I have been involved in the development and promotion of the draft National Environmental Standards for both Ecological Flows and on Plantation Forestry and provided advice and submissions in the development of the National Policy Statement for Freshwater Management. I have been centrally involved in various working groups and in the Small Group of the Land and Water Forum during the production of their three reports over the last four years as well as being on the advisory panel for the Government's National Objectives Framework for Water Quality.

5. I have frequently appeared at local authority resource consent and planning hearings as an expert witness or on behalf of Fish and Game and other bodies, as a consultant for development proposals such as hydropower schemes or for government agencies. I coordinated initially DoC and later Fish and Game contributions and negotiations on the Buller and Motueka Water Conservation Orders, including the drafting of the conditions now attached to those water conservation orders. I have provided advice to other Fish and Game Councils prior to their applying for Water Conservation Orders, such as that for the Rangitata. I was also a principal witness in the hearings for the Motueka and Buller Water Conservation Orders, including before the then Planning Tribunal and Environment Court. I have also contributed to planning hearings on regional water plans, including those few which have been produced in Canterbury (particularly on wetlands) and given evidence in the North Bank Tunnel/Hunter Downs case in the Waitaki.
  
6. I have been invited by Environment Canterbury ("ECan") to participate in the Land Use Water Quality Governance Group, initially focussing on the Hurunui catchment, and more recently on their Policy Advisory Group looking at providing advice on the delivery of land use controls to improve water quality in the region, including most recently the Selwyn-Waihora Zone.

7. I undertook my secondary and tertiary studies in Canterbury and am familiar with many of the water bodies in Canterbury, having undertaken tramping, climbing, fishing, gamebird hunting, drift diving, electric fishing, jet boating, salmonid spawning, wildlife and recreational surveys in various parts of the region and many of its waters at various times over the last 40 years. In addition, the Nelson Marlborough Fish and Game region includes all the former Marlborough Catchment Board area as far south as the Conway River catchment, so have undertaken various aspects of field work more recently and in more detail in that part of the region.
8. I contributed to the joint Fish and Game New Zealand ("FGNZ") submission on the Land and Water Plan, particularly focussing on the large scale policy issues, as well as some local issues for the Nelson Marlborough Fish and Game region.
9. As referred to above I am employed by Fish and Game, a statutory body whose functions include to advocate for the interest of Fish and Game in the management of sports fish and game and their habitats (section 26C Conservation Act 1987). Notwithstanding this, I am aware of, and in preparing this evidence have complied with, my overriding duty to assist the Hearing Commissioners impartially on matters within my area of expertise.
10. I confirm that I have read and agree to comply with the Code of Conduct for Expert Witnesses. This evidence is within my area of expertise, except where I state that I am relying on what I have been told by another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

## **SUMMARY OF EVIDENCE**

11. This evidence summarises the statutory role of Fish and Game Councils, their regional structure and the development of Sports Fish and Game Bird Management Plans and their relevance to this

resource management plan. It outlines the sports fish and game species and their relevance to the Resource Management Act ("RMA") management of species' habitats. It outlines in broad terms, the habitat requirements of the species administered by Fish and Game. It also summarises, together with evidence from Messrs Millichamp and Webb, the values and significance of many of the water bodies in the Canterbury region from a Fish and Game perspective and the basis for the inclusion of these waters into Schedule XX. In particular, the results of the National Angler Surveys and Gamebird Harvest Surveys are summarised in respect of the Canterbury Region. I also refer to the habitat requirements of salmonids and gamebirds which are relevant to the provisions of this plan. Other contributions to Schedule XX have been made by the white water and jet boating representative organisations (refer to paragraph 90). The evidence also provides some specific comments on parts of the Environment Canterbury staff Section 42a report in respect of the submissions by Fish and Game.

#### **FISH AND GAME NEW ZEALAND AND FISH AND GAME COUNCILS**

12. FGNZ is the collective 'brand' name for the 12 regional and one NZ Fish and Game Councils, which are established under Part VA of the Conservation Act 1987 and exercise statutory powers under that Act and the provisions of the Wildlife Act 1953 and their subsidiary legislation.
  
13. The function of the NZ Fish and Game Council is detailed in Section 26C of the Conservation Act 1987, while the functions of each of the regional Fish and Game Councils is set out in Section 26Q of that Act. These provisions are included in full in Appendix 1 to this evidence, with matters of particular relevance underlined. The key provision is that the function of Fish and Game Councils is to *"manage, maintain and enhance the sports fish and game resource in the recreational interests of anglers and hunters"*.

14. This includes in section 26Q(1)(e):

*“in relation to planning,—*

*(i) to represent the interests and aspirations of anglers and hunters in the statutory planning process; and...*

*(vii) to advocate the interests of the Council, including its interests in habitats:”*

15. Fish and Game Councils are public entities under the Public Finance Act, funded almost entirely by the sale of fishing and hunting licences and governed by Councils elected from adult whole season licence holders. The Councils are obliged to produce audited annual reports to Parliament and report to Ministers of Conservation, but cannot be directed as to their activities by the Minister, provided they are operating within the requirements as set out in some detail in the legislation. While they undertake statutory functions, including a specific obligation to advocate the interests of anglers and hunters in the statutory planning process (26Q(1)(e)), the costs of managing these do not fall on the tax or ratepayer, as in most such jurisdictions internationally, but on the fishing or hunting licence holder.
16. Fish and Game Councils also undertake considerable investigations into and management of the species for which they are responsible. This involves considerable field work and assessment of both the species and the anglers and hunters who participate in the recreation. We are familiar with many of the water bodies affected by the Land and Water regional plan.
17. The Canterbury Regional Council area covers a small part of one (Nelson Marlborough), almost all of one (Central South Island), and all of one (North Canterbury) Fish and Game regions, as shown on the following map. This evidence and the Fish and Game case is therefore an integrated approach on behalf of all three regions. As noted in the relevant statutes attached in **Appendix 1** to this evidence, each separate Fish and Game region is a separate statutory body and although managed in a similar fashion is relatively autonomous. This can be seen in the different structures of their Sports Fish and Game

Management Plan provisions (Appendix 3); all of which were produced and approved at different times by different processes.



Figure 1 South Island Fish and Game Regional Boundaries

## SPORTS FISH AND GAME BIRDS

18. Species managed by Fish and Game Councils as sports fish and game birds are established as sports fish in the Schedule attached to the Freshwater Fisheries Regulations 1983 and the First (Game) Schedule to the Wildlife Act 1953. These species have been managed for recreational and other purposes for more than 100 years and, in the case of the salmonids, were first introduced into the country under legislation intending to provide for them as fisheries which was passed in 1867.
  
19. Please note that the species in these schedules change from time to time and are included in these schedules as species appropriate to be managed for recreational fishing or hunting. These schedules are not primarily based upon a species 'pest' status, or whether or not they are indigenous, but on suitability for recreational harvest and management. This means the species have to be sought after by anglers and hunters as suitable for human consumption, maintain viable wild populations or populations supplemented by rearing

programmes and remain associated with the recreational pursuit and management to achieve this end. While the primary purpose for management of these species is to enable the recreations of fishing and hunting, Fish and Game Councils are obliged to consider the effects of these species on other parties and respond to any concerns that might arise from other parties.

20. All the key sports fish and most of the game species were introduced to New Zealand pursuant to specific legislation with the approval of central government. Trout and salmon particularly have proven very successful and now sustain major recreational fisheries which make significant economic contribution. Anglers specifically visiting New Zealand to participate in trout fishing, for example, are the highest per capita spenders of all tourists<sup>2</sup>.

### **Sports Fish in the Canterbury Region**

21. Canterbury has a diversity of sports fish compared to many parts of New Zealand. The major sports fish in the Canterbury region are Chinook (also known as King or Quinnat) salmon (*Oncorhynchus tshawytscha*); rainbow trout (*Oncorhynchus mykiss*); and brown trout (*Salmo trutta*). These three species are widespread throughout the region. Canterbury is best known in sports fishing circles internationally for its superlative Chinook salmon fishery centred on the region's major rivers. Messrs Millichamp and Webb will provide more detail on the salmon fisheries in the region. Until recently with the development of a self-sustaining Chinook salmon population in southern Argentina, the New Zealand Chinook salmon population was the only self-sustaining wild salmon fishery established outside the natural range of salmon in the northern hemisphere. Chinook salmon are also located in several Canterbury high country lakes, where they complement the trout fishing opportunities for boat and shore-based anglers.

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<sup>2</sup> Ensor, G NZ Tourism Department; personal communication.



22. The trout fishery in Canterbury includes both rainbow and brown trout. While both species are widespread throughout Canterbury in rivers, streams and lakes, the quality and viability of the trout fisheries in many of the lowland waters of the region has declined with the reduction in water and habitat quality and quantity, particularly in the last two decades. High country angling quality has changed little, by comparison, but has been affected by increasing accessibility to the high country by anglers.
23. Other sports fish of interest in some parts of Canterbury include sockeye salmon (*Oncorhynchus nerka*), mainly in and adjacent to Lake Ohau; brook trout or char (*Salvelinus fontinalis*) in some smaller high country lakes and tarns; lake trout or char (*Salvelinus namaycush*) which has its only New Zealand population in Lake Pearson; perch (*Perca fluviatilis*) found in many smaller ponds and lower reaches of lowland rivers; and tench (*Tinca tinca*) found in similar areas to perch. All the sports fish are members of the salmon family, except the latter two species which are labelled coarse fish, with a small but devoted following of coarse anglers mainly fishing in still waters.

### Gamebirds in Canterbury

24. The introduced mallard duck (*Anas platyrhynchos*) is the mainstay of gamebirds in New Zealand and is no exception in Canterbury. Mallards freely interbreed with the native grey duck (*Anas superciliosa*) and many of the birds shot by hunters are clearly hybrids between the two. Research by New Zealand's foremost waterfowl biologist, Dr Murray Williams, has shown<sup>3</sup> that most ducks appearing to be mallards carry some grey duck genes. True grey ducks are now rare in Canterbury except in remoter areas of the high country, but still predominate in some areas such as Molesworth. Grey ducks are also found throughout the Pacific and Australia. The New Zealand

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<sup>3</sup> Williams, M and B Basse (2006) **Indigenous gray ducks, *Anas superciliosa*, and introduced mallards, *A. platyrhynchos*, in New Zealand: processes and outcome of a deliberate encounter** *Acta Zoologica Sinica* **52**:579-582

Shoveler duck (*Anas rhynchos*) is endemic to this country, and is found throughout the country and is common in Canterbury, particularly in lowland waters. Paradise shelduck (*Tadorna variegata*) is another New Zealand endemic species, which has thrived in recent decades due to pasture development and is now the second most commonly shot gamebird and is abundant throughout Canterbury. Black Swan (*Cygnus atratus*) is both introduced and self-introduced from Australia in the mid 1800s; now considered to have been rendered extinct during Polynesian settlement. It is very abundant on some Canterbury lowland lakes, with New Zealand's largest population of some 80,000 present on Te Waihora (Lake Ellesmere) prior to the 1968 Wahine storm. Numbers are now much less as their favoured plant food *Ruppia* is now much less abundant there. The last waterfowl, currently a gamebird, is the rail pukeko (*Porphyrio melanotus*), which is locally abundant, particularly in lowland swamps and spring fed waters. The Canada goose (*Branta canadensis*) was a game bird until its removal from the Game Schedule in 2011; it now has no particular status as an unprotected species under the Wildlife Act.

25. There are three species of upland game found in Canterbury. Pheasant (*Phasianus* spp.) is common in low numbers in scrub country such as river beds, while Californian quail (*Lophortyx californica*) is also common in these areas but more widespread. Chukar partridge (*Alectoris graeca chukar*) is found in the high country, mainly in relatively low numbers.

### **Angler and Hunter numbers in Canterbury**

26. Sports fishing and gamebird hunting are popular recreational pursuits in Canterbury. New Zealand salmon fishing is centred on the major rivers of Canterbury, with limited river salmon fishing opportunities in Marlborough, Otago and the southern West Coast of the South Island or of landlocked populations of mostly smaller salmon in some of the larger South Island lakes. Due to the large population centres in the region, and the diverse attractions of the major rivers, smaller rivers,

many lowland wetland wildlife habitats and high country lakes and rivers, Canterbury provides a diversity of fishing and hunting opportunity. All of the North Canterbury fishing and hunting licences, most of those in the Central South Island region, and a small proportion of those sold in the Nelson Marlborough region are sold in the Canterbury region. As fishing and hunting licences are inter-available (that is they can be used anywhere in the country except for the DoC managed Taupo fishery), many of the users of the sports fish and game bird resource in Canterbury come from other regions; particularly attracted by the salmon fishery and the abundant gamebird hunting opportunity. Central South Island has consistently the highest hunter bags taken during the hunting season and the highest bag limits in the country.

27. Fish and Game has a nationally coordinated and funded role to undertake research on sports fish and gamebirds, and anglers and hunters and their success and satisfaction. Towards this end, Fish and Game coordinates both regional and national surveys of and research into both the sports fish and game bird resource and the recreational activities and aspirations of anglers and hunters. The major efforts have been the National Angler Survey (NAS)<sup>4</sup> and the nationally coordinated Gamebird Harvest Survey.

## **NATIONAL ANGLER SURVEYS**

28. A periodic major recreational freshwater angling survey is undertaken nationally at approximately seven yearly intervals; the NAS. The most recent quantitative surveys have been undertaken during the 2007 – 2008 fishing season, but also prior to that in the 1994 – 1995 season and the 2001 – 2002 seasons. One of the great advantages for Fish and Game is that all those fishing are required to purchase a fishing licence, including the contact details of the licence holder. Therefore Fish and Game is able to undertake surveys nationally of **all** resident

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<sup>4</sup> eg Unwin, MJ (2009) **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

anglers (except for those anglers fishing the DOC managed Taupo fishery). This has meant that Fish and Game has a far greater opportunity to undertake rigorous and scientifically defensible surveys of angling use at a national level than any other form of outdoor recreation, which can enable comparison of angling use at a national level.

29. Each survey involved a telephone survey of part and whole season resident anglers in each region throughout the country undertaken at two-monthly intervals for the entire fishing season from the 1 October until 30 September the following year. Anglers were asked which rivers or lakes they had fished over the preceding two month period, where the unit was an 'angler day', being any time spent fishing on a particular water body during a particular day. Usage of rivers from 'out of region' anglers were also noted.
30. A total of some 1,150 lakes and rivers were identified by anglers across the country over the period of the survey, with the survey able to generate not only an estimate of the number of angler days per water body with an associated standard error, but also the pattern of use between types of licence, ages of angler, and place of residence of those anglers.
31. This enabled further analysis of the data such as a 'travel cost' analysis of the distance travelled by anglers between their stated home address and the rivers or lakes they fished<sup>5</sup>. The travel cost method is a way of estimating value based upon the distance participants in a recreational pursuit are prepared to travel in order to participate in their chosen activity. It is based upon the assumption that the further an 'average' participant is prepared to travel, the greater value is attached to the place in which they undertake that recreation. An additional email survey of non-resident anglers was

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<sup>5</sup> eg Unwin, MJ and NA Deans (2003) **Travel distance as an index of angling value: a preliminary study based on the 2001/02 National Angling Survey** NIWA Client Report: CHC2003-113

undertaken during the period of the 2007-8 survey to gain an estimate of the angling effort by non-resident anglers, which could be added to that of resident anglers. To enable comparison between the earlier surveys which did not include a non-resident component, the non-resident data have been separated in the attached table.

32. A summary of the results of the NAS over the three survey periods for the water bodies in the Canterbury region is **attached** as **Appendix 2** to this evidence. This is also referred to in the submission made on behalf of the three Fish and Game regions. Each of the columns lists the estimate of New Zealand resident angler use for the whole season in angler days per season. Note that some water bodies are able to be fished for 12 months (usually some of the larger lakes and the lower reaches of larger rivers) but most are closed for five months over the winter period to protect spawning fish and enable fish to return to condition. In addition, the standard error of each summary is provided. Note that there is an estimate of non-resident angler use for the 2007 – 2008 fishing season only, which is added in a separate column.
33. Sports fishing in Canterbury show some differences from other regions; most notably the highly regarded salmon fishery, the related lesser importance of the trout fisheries compared with other regions such as Eastern (Rotorua Lakes), Nelson Marlborough or Otago/Southland and the relatively small proportion of overseas angling use (around 3% compared with 16% on the West Coast or Nelson Marlborough). The salmon fishery is highly regarded, but mainly by New Zealand resident anglers.
34. Changes in angling use between surveys can be noted for some waters and not others. It is difficult to necessarily assume that these changes represent real changes in patterns of usage given that these were samples of only three years over a 15 year period. As noted by Messrs Webb and Millichamp, angler use, success and satisfaction varies considerably between seasons in the salmon fishery, as a function of significant but apparently natural fluctuations in salmon

runs between seasons. There does not appear to be any overall trend in these fluctuations.

35. The overall totals of angler effort across NZ at large changed relatively little between the surveys, despite the significant fluctuations in effort by salmon anglers. There has been a trend, however, from fishing in lowland rivers towards fishing in lakes, particularly larger lakes, between the three surveys.
36. Nowhere is this more evident than in Canterbury. The reduction in angling effort in lowland trout fisheries in Canterbury, however, is a source of major concern to Fish and Game and is reflected in major concerns expressed by anglers to Fish and Game and to the community at large about the state of these smaller lowland rivers and lakes as habitats for trout and locations to go fishing. The NAS revealed 60 lowland waters fished almost entirely by trout anglers during the three surveys. The total resident estimated angler use of all these 60 waters in the 1994 – 2005 season was about 64,600 angler days for that season. This had reduced in the 2001 – 2002 season to an estimated total of 39,400 angler days; a reduction of about 39%. This angling effort apparently stabilised to an estimated 39,900 angler days for the 2007 – 2008 season.
37. Mr Millichamp has provided details of the changes over time in the Selwyn River trout population in his evidence, a specific example of the kind of change which these surveys show appears to be more widespread across Canterbury. Nineteen of these 60 lowland waters fished in 1994 – 1995 or 2001 – 2002 were not fished at all in 2007 – 2008. Only one of the 2007 – 2008 waters was newly fished in 2007 – 2008, not having been fished earlier. Note these comparisons do not include newly created waters such as Lakes Hood and Opuha which did not exist in 1994 – 1995, although their totals are included in the overall trend data noted above.

38. By contrast, there has been an increase in lake and canal fishing over the period of these surveys, particularly in the upper Waitaki. More anglers appear to be fishing as part of their holiday rather than casually from home. The large trout in the hydro canals in the upper Waitaki have provided a new angling experience. North Canterbury anglers are the most willing to travel and visit other adjacent regions of any anglers in the country. Whether this is a reflection on the paucity of trout fishing opportunities available near the major population centres in Canterbury is unclear.

### Travel Distance

39. Given that anglers provide their home address, it is possible to analyse the data for New Zealand resident anglers to assess the value of different water bodies according to both usage and the average travel distance from their place of residence. This analysis was undertaken by Martin Unwin and I<sup>6</sup> using the 2001 NAS data and can develop a metric of both average travel distance from an angler's residence and the amount of usage, as summarised in the table below. The table sets these out, including both usage and average travel distance multiplied, in descending order of the latter. It is useful to note that 10 of the 30 highest ranking waters in the country are in Canterbury, shown on the table in **bold**.
40. This also contrasts the general popularity of salmon fishing for Canterbury residents who tend not to travel far from home, on average. This should be compared with the importance of mainly trout fishing for visitors who on average travelled further to the McKenzie Country waters, with the Hurunui River showing significant distances travelled for both salmon and trout fishing. Note that, in general, headwater trout fisheries such as the Ahuriri River and upper Hurunui River below Lake Sumner are valued by anglers for the quality of the fishing and size of trout, which are large by international standards.

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<sup>6</sup> Unwin, MJ and NA Deans (2003) **Travel distance as an index of angling value: a preliminary study based on the 2001/02 National Angling Survey** NIWA Client Report: CHC2003-113

The amount of back country trout fishing available in such rivers is affected by other anglers to a significant extent, so it is unusual that such high numbers of anglers utilise these rivers, as well as have a comparatively large travel distance by those anglers. This data does not include use of these rivers by overseas anglers, which tends to be disproportionate in highly valued backcountry fisheries such as the Ahuriri.

<b>Catchment/River</b>	<b>Day visits (x 1000)</b>	<b>Standard Error</b>	<b>Mean Travel Distance<sup>7</sup></b>	<b>Day visits x Mean Travel Distance</b>
Clutha R	36.7	4.1	65	2386
Mataura R	52.9	3.9	34	1799
<b>Waitaki R</b>	<b>26.6</b>	<b>2.6</b>	<b>53</b>	<b>1410</b>
<b>Rakaia R</b>	<b>21.5</b>	<b>2</b>	<b>50</b>	<b>1075</b>
<b>Waimakariri R</b>	<b>48.9</b>	<b>4.3</b>	<b>21</b>	<b>1027</b>
Waiau R (Southland)	14.6	1.5	62	905
<b>Tekapo Canal</b>	<b>7.7</b>	<b>0.9</b>	<b>115</b>	<b>886</b>
Wairau R	8.3	0.9	90	747
<b>Rangitata R</b>	<b>12.7</b>	<b>1.9</b>	<b>58</b>	<b>737</b>
<b>Tekapo R</b>	<b>4.9</b>	<b>0.7</b>	<b>147</b>	<b>720</b>
<b>Ohau Canal</b>	<b>5.4</b>	<b>2.1</b>	<b>133</b>	<b>718</b>
<b>Hurunui R</b>	<b>8.2</b>	<b>1</b>	<b>85</b>	<b>697</b>
Taieri R	19.1	2.6	33	630
Rangitaiki R	13.3	3.5	47	625
Mohaka R	7	0.7	68	476

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<sup>7</sup> This figure is log transformed and weighted to reduce bias from varying sample sizes, found in Table 1 of the report.



Tukituki R	17.2	1.5	25	430
Motueka R	6.3	0.7	67	422
<b>Ahuriri R</b>	<b>2.9</b>	<b>0.6</b>	<b>119</b>	<b>345</b>
Manuherikia R	5.6	2.1	56	314
Waikato R	7.1	1.4	43	305
Buller R	4.3	0.5	69	297
Oreti R	20.6	2.1	14	288
Hawea R	5	1.3	57	285
Rangitikei R	5.9	0.7	47	277
Waikaia R	6.9	1.2	40	276
Ruamahanga R	6.8	0.8	38	258
<b>Opihi R</b>	<b>13.4</b>	<b>1.7</b>	<b>18</b>	<b>241</b>
Mararoa R	3	0.6	78	234
Ngongotaha Stm	17.8	2.9	13	231

**Table 1.** Value of the 30 river catchments with the highest use by mean travel distance, in descending order, modified from Unwin and Deans, 2003, with Canterbury Rivers shown in **bold**.

### **Gamebird Harvest Survey**

41. Each year every Fish and Game region samples gamebird hunters on their hunting success at two-weekly intervals during the hunting season. While this is intended largely for internal use, it is of interest to compare harvest rates for the same species in different regions. The Central South Island Fish and Game region (lying south of the Rakaia River catchment) has consistently the highest harvest rate of all Fish and Game regions, with the North Canterbury region often close behind<sup>8</sup>. This is likely a result of the combination of large food sources and relatively few wetland habitats from which hunters can harvest large numbers of gamebirds.

### **VALUES OF PARTICULAR WATER BODIES IN THE NELSON MARLBOROUGH FISH AND GAME REGION**

42. The sports fishing and game bird hunting values of particular water bodies have been recorded in a number of locations over a considerable period. Sports Fish and Game Bird Management Plans set these out in varying levels of detail, as noted in the next section.
43. My evidence refers to the values of waters in the Nelson Marlborough Fish and Game region, which includes those parts of the former Marlborough Catchment Board area not now included in Marlborough District. This includes the Kekerengu River catchment, the entire Clarence River catchment, which is shared between the Environment Canterbury region and Marlborough District; the various smaller tributaries between the Clarence as far south as the Conway River catchment.
44. The Clarence River provides a regionally significant brown trout fishery (mainly in the headwaters upstream of the Acheron River confluence) and Chinook salmon fishery (with most fish taken at the

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<sup>8</sup> Graybill, J, pers.comm.

mouth of the Clarence River)<sup>9</sup>. The major spawning areas in these rivers for both species lie upstream of the Acheron River confluence, including both the mainstem of the Clarence River for salmon and many of the upper tributaries including the Styx, Leaderdale, and various unnamed tributaries for brown trout. Lake Tennyson is also a popular trout fishery with a camping area adjacent the lake.



Figure 2 Lake Tennyson, a popular camping and fishing area near the source of the Clarence River, looking towards Maling Pass.

45. Almost the entire upper Clarence River catchment lies within Molesworth Station, now managed as a recreation reserve, which also provides habitat and hunting opportunity for gamebird hunting.

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<sup>9</sup> Note the regional council boundary with Marlborough straddles the catchment boundary, sometimes running along the mainstem bank, with the major northern tributary, the Acheron River, lying entirely in the Marlborough District.



Figure 3 Middle Clarence River from Cloudy Range Station; iconic back country fishery, wilderness rafting and kayaking river with a series of desert-like gorges.

46. Most of the smaller catchments along the Kaikoura coast do not support salmon or trout fisheries, due to their small size or their steep and torrential nature. Those streams supporting trout fisheries include the two spring fed streams near Kaikoura on the plain, Middle Creek and Lyell Creek, which are locally important fisheries, with some limited trout fishing opportunities in the Kahutara River and Oaro Rivers. The best of the local trout fisheries is the Conway River, which is unusual for a lowland Canterbury River remote from any significant population centres in that estimates of its angling use have **increased** over the time of the three NAS from 1994-5 until 2007-8. This is partly a reflection on the decreased quality of the other lowland rivers, and the comparatively low rates of irrigation or land use intensification in the Conway River catchment until recently. I refer to the flow regime necessary to sustain this trout fishery in the evidence below.





Figure 4 Electric Fishing in the Charwell; a tributary of the Conway River catchment.

47. Gamebird hunting occurs at a number of sites, mainly on private land, throughout the Kaikoura area. The most prominent publicly administered area of waterfowl habitat is the Kaikoura Lakes. The largest of these lakes, Rotorua, is managed as a wildlife management reserve which provides for hunting, administered by the DoC. Fish and Game has been actively involved in the management of this reserve, by, for example, undertaking the original fencing of this reserve from stock of the adjacent farm.



Figure 5 Lake Rotorua Wildlife Management Reserve, Kaikoura Lakes, which provides a diverse range of wildlife species and gamebird hunting opportunities.

#### **SPORTS FISH AND GAME MANAGEMENT PLANS**

48. Each of the three Fish and Game regions which form parts of the Canterbury region covered by this proposed land and water plan have operative Sports Fish and Game Management Plans, which have been prepared for and approved by the Minister of Conservation in accordance with the provisions of Sections 17L, 17M and 17N of the Conservation Act. These are statutory plans to which regional councils are required to have regard to under Section 66(2)(c)(i) of the RMA in the preparation of regional plans such as this proposed Land and Water Plan.
49. The relevant provisions of each of these plans are summarised in Appendix 3 to this evidence.
50. It is not clear the extent to which these plans have been considered in developing the proposed Land and Water Plan. It would be appropriate and helpful to ensure that the sports fish and game (and other) values of the water bodies identified in these plans, and in other planning documents such as Water Conservation Orders and earlier

regional plans are also identified and provided for in this plan. This is the underlying reason for Fish and Game seeking the inclusion of a schedule XX to the Land and Water Plan identifying values. This is to inform what water quality and quantity and habitat management is required, on an interim basis to provide for those values, and restore them where appropriate, as well as provide detail for catchment management in due course.

### **Habitat Requirements of Sports Fish and Game Birds**

51. Salmonids, particularly trout, are the most studied fish in the world. In general, their habitat requirements are well known and generally exceed those of many of the native fish species to the extent that these are known. Thus the protection of the **habitat** of trout and salmon, where appropriate, as set out in Section 7(h) of the RMA, also provides for native species as well. For this reason, as set in more detail in the evidence of Dr Young and Professor Death, it is crucial that the pCLWRP includes specific reference to water quality and quantity standards and limits, such as a modified version of Table 1a and policies on general environmental flow requirements, to set out clearly what is required to sustain those fishery habitats. Providing for the salmonid habitats will also provide for most other instream habitats and values and for life supporting capacity generally in these water bodies. The version of Table 1a proposed by Fish and Game is attached to my evidence as **Appendix X4**
  
52. This reference to protection of the habitats of these species does not necessarily imply a preference for the management of that species *per se* in that location. Management of the individual freshwater fish species is covered in some detail in the provisions of the Conservation Act (notably Parts VA and VB) and subsidiary legislation, including the Freshwater Fisheries Regulations 1983 and Conservancy Management Strategies, Freshwater Fish Management Plans, Sports Fish and Game Management Plans and annual Angler's Notices, for example. This is not a matter for the RMA, but is instead covered by those institutional arrangements between DoC, Ministry of Primary

Industries and Fish and Game Councils. Where there are concerns about the effects of trout, for example, on native fish species, these are properly addressed through those specific species related planning mechanisms and subsequent statutory management rather than any RMA provisions or regional plans. Regional water plans, instead address themselves to the provision of the habitat for the relevant species in any particular water bodies rather than attempting to discriminate between species through manipulation of their habitats, unless this was a specific request of the relevant statutory agency or agencies.

53. Freshwater habitat requirements for fish generally include three broad components; water quantity, water quality and physical habitat, such as river gravels, riparian margins or additional structures such as weirs, groynes or fish screens or passes. Note that the requirements for the recreational activity of angling or for boating or other such activities (rather than the habitat requirements for the fish) may also differ from or be additional to those for the species habitat.
  
54. Water quantity *per se* is seldom an issue for still water bodies, although the extent of water level fluctuations in lakes and wetlands can significantly affect the productivity and utilisation of the crucial littoral edge area habitat by fish and wildlife. By contrast, the habitat requirements of fish in rivers are significantly affected by the quantity of water; particularly by the extremes in flows. Floods physically disturb river beds and habitats, can redistribute or destroy fish and food sources and reset ecological processes. Middle range flows provide the basis for the major food sources for fish in rivers; particularly the underlying algal, macrophyte and invertebrate food resources. Annual low flows provide a physical restriction or 'bottleneck' on the amount of available habitat to sustain the population of fish, particularly for as adult trout reside in rivers for several years or for salmon at critical times such as entering across a river bar or accessing a spawning tributary. Dr Young is providing more detail on the consequences for salmonid habitat of changes in the quantity of water available.



### **Salmonid Life History**

55. Management of the trout and salmon fisheries is largely to sustain suitable habitat to enable thriving populations of these species, and, where appropriate, to regulate harvest to ensure this is undertaken sustainably. Most fisheries are wild stocks; that is, they rely on the natural spawning of fish which undertake their entire life in the wild. Thus it is crucial that habitat requirements are provided in all times and places necessary to sustain these stocks.
56. The two main trout species in Canterbury have similar life cycles, with some differences in habitat preferences and the timing of major spawning runs. While adult trout generally live in medium sized to larger lakes and rivers, they are adapted to feed over the summer period to put on condition to enable spawning in late autumn or early winter in small spawning streams, usually in the upper parts of their catchments. These spawning streams can be quite small, and trout run up into them during freshes and minor floods in late autumn to get as far upstream as possible. This reduces the risk of floods later disturbing the vulnerable developing eggs or fish larvae in gravels, and means the location of spawning may vary considerably from year to year depending upon rainfall at the time of spawning. Maintaining the habitat of suitable spawning areas is crucial to the on-going survival of these wild stocks of salmonids.
57. The females dig a nest or redd, preferably in pea-sized gravels at the head of riffle sections which have clear, cool, well oxygenated water running through the gravels and with low levels of fine sediment. Streams with more stable flows are favoured as these are less likely to suffer flood damage and loss of developing eggs or larval fish. After the males fertilise the fish, they may guard the site for a period before ultimately running back to the main river or lake. The eggs grow for a period of about 6 weeks, depending upon water temperatures. The hatching larval fish or alevins retain a yolk sac and remain in the gravels for a further four weeks before emerging as fry at about 60

mm. A high proportion of these young are highly vulnerable to disturbance, predation and other factors, with around 1% of these fish likely surviving to adulthood.

## TROUT LIFE CYCLE

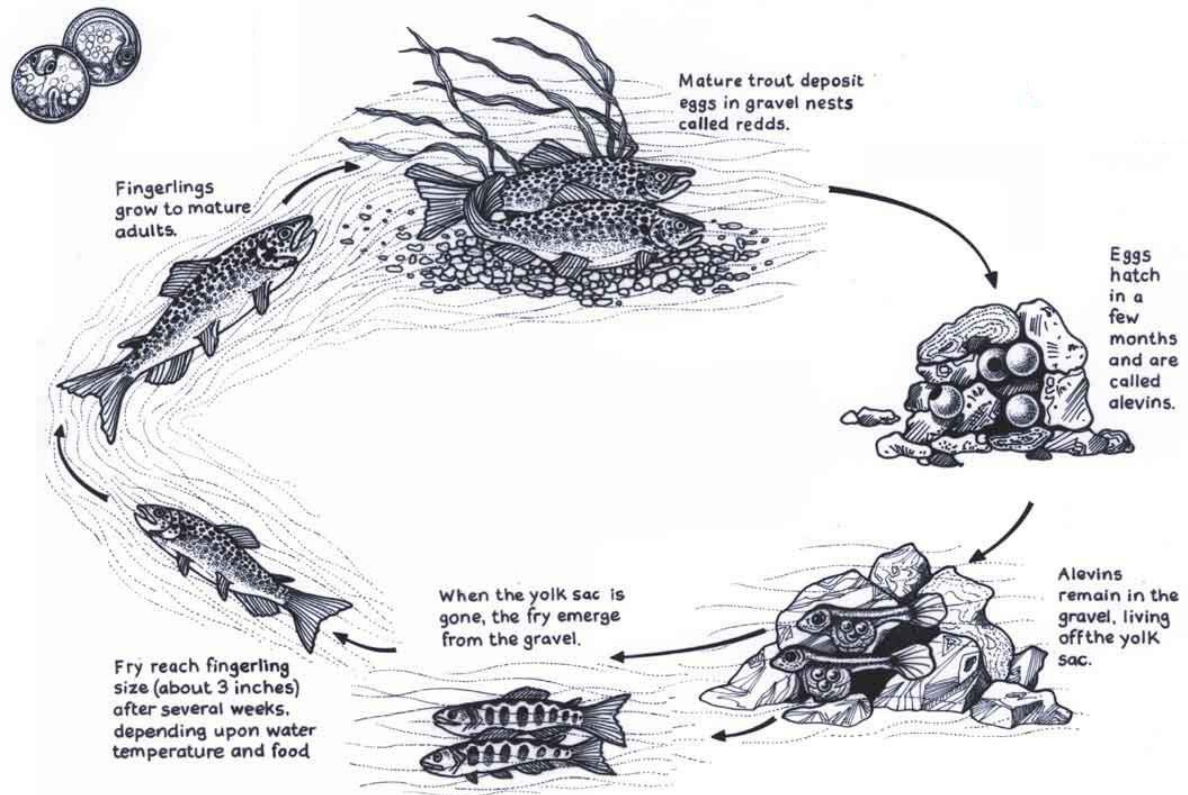


Figure 6 Summary of trout life cycle

58. Retention of suitable high quality spawning waters; both water quality and quantity is therefore crucial to the survival of wild stocks of trout. There can be considerable seasonal variability in juvenile fish production due to natural factors, but their productivity can be significantly affected by deposition of fine sediment, particularly under low flow conditions, clogging the interstices and suffocating developing eggs or alevins, or clear felling trees increasing water temperatures which reduces the amount of oxygen in water passing through the gravels and damaging developing eggs.
59. It is an offence under Section 26ZJ of the Conservation Act to disturb spawning waters of any freshwater fish (see Appendix 1), although I am unaware of any successful prosecutions. The Conservation Act, however, does not constrain activities in water bodies generally so it is important that the habitat provisions of the RMA integrate with the fisheries objectives to ensure that spawning habitats are identified and activities detrimental to these are avoided, remedied or mitigated. In an analogous fashion there are requirements in Part VI of the Freshwater Fisheries Regulations, administered by DoC, on those who may place structures in water ways to incorporate fish passage. In practice DoC tends to seek that the resource consent process addresses any fish passage or screening issues rather than administer a parallel regulatory approach.
60. Therefore Fish and Game seeks, in this plan, the retention of high water quality and quantity in spawning streams from late autumn until mid until late spring to ensure that spawning activity and growth of sensitive eggs and alevins is not impacted by activities which cause contamination or habitat loss. Many spawning tributaries also provide habitat for developing trout which may remain in those spawning tributaries for up to 18 months after emergence from the spawning gravels before venturing into the larger water bodies downstream as adults.
61. Most trout live and spawn multiple times and may live up to 12 years, although commonly adult fish may only survive half that time. Trout

generally spend much or all of their life in freshwater, although a small proportion may live in estuaries or enter salt water and return to freshwaters in another catchment. Recent radio tagging and chemical analysis of fish otoliths (inner ear bone) has shown that while many trout move little at any particular time, most undertaken migratory movements in response to floods, low flows, to find suitable food sources or for reproduction. Some individual fish show high site fidelity and can move considerable distances seasonally<sup>10</sup> but often return whence they came.

62. Maintaining an adequate food supply is critical for trout. While they can survive on poor food sources, they will neither thrive nor put on condition to enable successful spawning at the end of autumn; nor would poorly conditioned fish be favoured by anglers.
63. Most salmon, by contrast, have a somewhat different life cycle. Salmon are essentially a marine species which spawns in freshwater. Migratory salmon live at sea between three and five years and return into the river from which they had spawned. After spawning, salmon die as they do not feed on their return to freshwaters and convert most of their remaining biomass to reproductive effort prior to spawning. They spawn in a similar way to trout, but usually in larger gravels and larger streams; preferring stable spring - or lake - fed streams in the South Island high country. As these streams are spring fed, they are more vulnerable to introduction of fine sediment which is not flushed out by floods and freshes as it is in catchment fed streams. Messrs Millichamp and Webb refer in more detail to salmon spawning and rearing requirements in their evidence.
64. The exception for the wild fisheries are those in which limits to natural spawning requires some supplementary stocking of fish to sustain harvest. In Canterbury, stocking is restricted to a minor proportion of the salmon fishery in some rivers; particularly the Rakaia, with some

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<sup>10</sup> Up to 70 km each way in the Wairau River and 150 km in the Waikato-Waipara Rivers, for example.

limited eyed-ova<sup>11</sup> stocking undertaken in other areas such as the upper Clarence River from time to time. Stocking also occurs periodically in some high country tarns and lakes which have few or limited spawning streams.

## **WATER QUALITY**

65. Professor Death is providing specific details of the water quality requirements of salmonids in his evidence. This evidence sets out in broad terms the consequences for salmonids of different potential contaminants.
66. The four major parameters for the protection of adult trout are water temperature, dissolved oxygen, water clarity/turbidity and food<sup>12</sup>. As trout, in particular, have high water quality habitat requirements, they have been included both in the Act and as a potential water quality indicator by the Ministry for the Environment<sup>13</sup>.

## **Temperature and Dissolved Oxygen**

67. Salmonids are adapted to cool and relatively pristine waters. Temperature is a critical factor for cold blooded organisms such as fish, which generally are required to operate physiologically at the ambient temperature. A high proportion of the energy requirements of aquatic organisms is devoted to respiration; obtaining enough of the relatively small amount of oxygen dissolved in water, which is physically more difficult to pass over respiratory organs (gills) for gas exchange than movement of air through lungs.

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<sup>11</sup> Eyed ova are fertilised salmon eggs, which can be implanted into gravels to establish salmon fisheries in new locations.

<sup>12</sup> Hay, J., Hayes, J. and Young, R. (2006) **Water quality guidelines to maintain trout fishery values** Prepared for Horizons Regional Council. *Cawthron Report No. 1205*.

<sup>13</sup> Froude, V (1998) Environmental Performance Indicators: An analysis of Potential Indicators for Freshwater Biodiversity. MfE, Wellington. Technical Report No 48

68. Oxygen levels in water are also dependent upon water temperature. A 10<sup>0</sup> C increase in water temperature halves the amount of dissolved oxygen able to remain dissolved, while at the same time increasing the respiration rate of any coldblooded organism in that water. Thus cold water adapted species are particularly vulnerable to increases in water temperature above certain thresholds. Trout prefer water temperatures between 13 and 19<sup>0</sup> C in the case of brown trout, and will cease to feed above 19<sup>0</sup> C. While acute lethal temperatures for brown trout are around 26<sup>0</sup> C, trout will be unable to grow and will avoid temperatures above 19<sup>0</sup> C. Furthermore, developing eggs or larval fish are even more vulnerable, with acute lethal temperatures of 20<sup>0</sup> C. These critical temperatures need to be taken directly into the revised version of Table 1a if this is to deliver adequate salmonid habitat.
69. Maintenance of adequate oxygen levels in freshwaters is obviously crucial to all life, including salmonids. Developing eggs and larvae are particularly vulnerable to reductions in oxygen levels. Most flowing waters have adequate oxygen levels close to saturation due to physical re-oxygenation as water passes over rocks and riffles. Most lakes also have adequate oxygen levels due to wave action and/or photosynthesis, although the lower levels of deeper lakes below the thermocline can sometimes have low oxygen levels. Another area in which low oxygen levels can occur is where in slow moving rivers where there is either a large groundwater component low in oxygen (such as from a spring-fed source) and/or a high biomass of plant matter which generates abundant oxygen by photosynthesis during the day but where the high biomass consumes oxygen overnight resulting in pronounced diurnal fluctuations in oxygen levels. Maintenance of oxygen levels not less than 80% of saturation is crucial to the maintenance of suitable salmonid habitat. Once again, this threshold needs to be incorporated into a revised Table 1a.

70. A key feature of the trout fisheries in New Zealand is the large size to which trout can grow, compared to most trout fisheries around the world. The average size of trout in a national analysis<sup>14</sup> of back country or headwater trout fisheries, was measured at 4.82 lb or 2.19 kg for brown trout and 4.64 lb or 2.15 kg for rainbows, with some back country rivers having a small proportion of trophy sized fish (above 10 lb or 4.5kg). The large size<sup>15</sup> to which these trout can grow is a unique feature of the combination of clear and cool waters with abundant large macroinvertebrates and suitable water temperatures over the whole year; unlike the northern hemisphere waters of their origin.
71. It is notable that Canterbury has relatively few of these waters compared to many other South Island high country areas due to relatively high levels of sediment found in many alpine waters where such waters are usually found. This means any of such clear waters are particularly important to trout anglers in Canterbury, who are numerous but have, compared to the West Coast, Otago or Nelson, relatively few waters close to home to go trout fishing. Clear back country waters are also sought after by anglers in providing suitable conditions for 'sight' fishing to fish in very clear waters; a style of angling more akin to hunting than most types of fishing. Such fishing waters are highly sought after and provide the main attraction for overseas anglers seeking trophy trout in these conditions. Canterbury has relatively few of these waters, but those such as the Ahuriri, upper Clarence, upper Waiau and upper Hurunui receive a significant proportion of Canterbury's overseas anglers and are highly valued by the region's trout anglers.

### Sediment/Clarity

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<sup>14</sup> Jellyman, DJ and E Graynoth (1994) **Headwater trout fisheries in New Zealand** NZ Freshwater Fisheries Research Report No. 12. NIWA ISSN 1171-9842

<sup>15</sup> Hayes, J. W., J. D. Stark & K. A. Shearer, 2000. **Development and test of a whole-lifetime foraging and bioenergetics growth model for drift-feeding brown trout.** *Transactions of the American Fisheries Society* **129**: 315–332.

Hayes, J. W., N. F. Hughes & L. H. Kelly, 2007. **Process-based modelling of invertebrate drift transport, net energy intake and reach carrying capacity for drift-feeding salmonids.** *Ecological Modelling* **207**: 171–188.

72. There is a strong relationship in most waters between suspended sediment and water clarity. These both affect fisheries in several different ways. Professor Death also refers to the problems arising from increasing sediment in his evidence. Fine sediment can cause two different physiological consequences for salmonids; the effects of fine sediment in suspension in the water column, and the effects of the deposition of fine sediment as it may settle out on the bed of the river or lake. Salmonids are diurnal and visual predators. This means their most common prey of invertebrates are most likely to be taken through visual cues. If water clarity is reduced, they will switch to feeding using olfactory or through use of their lateral line system. If they live in chronically high levels of suspended sediment, such as the 'glacial flour' of the McKenzie Country lakes, they will be obliged to feed using these techniques. Under these limitations, however, the fish generally will be smaller for their age and rarely will grow large,<sup>16</sup> and are also less available to the 'sight fishing' angler, particularly in rivers.
73. Salmonids and, indeed all freshwater fish, can tolerate short periods with very high suspended sediment levels up to 25 000 parts per million or more. Floods can carry such large amounts of sediment for short periods naturally. Any waters with elevated sediment levels for extended periods, however, will both reduce habitat suitability for important food sources and reduce the ability for salmonids to undertake visual feeding, thus reducing the maximum growth rates or reducing average fish size. Low sediment levels also favour abundant populations of the more favoured and larger mayfly, caddisfly and stonefly taxa amongst the invertebrate community as food for visual feeding trout in rivers, which enable them to grow larger on these larger prey. The main issue to ensure that sediment levels, wherever possible, reduce after high flow events in rivers to ensure maximal feeding opportunity. Keeping chronic levels of suspended sediment as low as possible is therefore important.

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<sup>16</sup> An exception being the huge trout now found in the Tekapo and Pukaki canals in the vicinity of salmon farms, which have learnt to feed either on excess salmon food or escaped young salmon.



74. Suspended sediment eventually settles out and in slow moving or still water. While floods elevate suspended sediment levels at times of high water velocity, little of this sediment settles out on the river bed due to high water velocities. Fine sediment inputs from instream activities at times of low flow in rivers is more likely to settle out and can reduce the quality of the substrate, both for the growth of suitable invertebrate food and also clogging the interstices in rivers and reducing oxygen levels there. Analysis of the '100 Rivers' research<sup>17</sup> (of 158 sites adjacent to river recorders in 88 rivers across New Zealand by drift dive counts of trout; ten sites of which were in Canterbury) undertaken in the late 1980s showed:

*"Brown trout biomass was related to a large number of instream habitat variables; these were square root of river gradient, in-stream cover, standard deviation of mean cross-section velocities, percentage in-stream vegetation, substrate size, and percentage gravel and silt substrates..."*

75. Jowett and Richardson (2003)<sup>18</sup> also looked at fish communities more generally using data from a sample of 1487 of the Freshwater Fisheries Database records, in which they noted the following about fish habitats:

*"Other environmental variables that were highly correlated with the fish community assignments were stream width and percentage of native forest or farming land use in the catchment upstream of the site. Of the local habitat variables, percentage of cascade habitat and percentage of sand substrate were the most important discriminators between communities."*

76. Therefore it is essential that sediment levels are kept below critical thresholds indicated in the revised Table 1a.

## Nutrients

77. Key limiting nutrients in freshwaters include nitrogen and phosphorus. Either or both of these can limit biological activity in freshwaters if at

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<sup>17</sup> Jowett, Ian G (1992) Models of the Abundance of Large Brown Trout in New Zealand Rivers *North American Journal of Fisheries Management* 12(3); and Jowett, IG (1990) Factors related to the distribution and abundance of brown and rainbow trout in New Zealand clear water rivers *New Zealand Journal of Marine and Freshwater Research* 24: 429-440

<sup>18</sup> Jowett, IG and J Richardson (2003) **Fish communities in New Zealand rivers and their relationship to environmental variables** *New Zealand Journal of Marine and Freshwater Research* 37(2):347-366

low concentrations; if they are both bioavailable they can lead to algal proliferation in the absence of frequent floods. Eutrophication or nutrient enrichment caused by elevations in both phosphorus and nitrogen, can lead to excessive periphyton growth, which can build up to high levels during periods of low/stable river flow. Periphyton proliferation may reduce invertebrate diversity by smothering habitats, and increase diurnal variations in dissolved oxygen and pH, which can increase the potential for ammonia toxicity. All of these changes can lead to a shift in community composition from less tolerant, larger collector/browser mayflies, caddisflies and stoneflies to being dominated by more tolerant, smaller filter-feeding caddisflies, chironomids, collector/browser beetles, snails and oligochaete worms. This may mean that invertebrate food for trout is less available or of lower quality.

78. Until recently, excessive nutrient levels were considered to largely have an indirect effect on salmonid fisheries, through build-up of periphyton (subject to lengthy periods of relatively constant flow) or increased planktonic biomass changing food webs, reducing food suitability and making waters less suitable for angling. There has been a greater recognition, due in part to work by Hickey and his colleagues originally commissioned by ECan<sup>19</sup>, of the additional toxic effects of nitrates in particular on fish, although ammonia and nitrites have long been known to have toxic effects on fish at relatively low concentrations given suitable pH and/or oxygen levels in freshwaters. Note that for mobile species such as salmonids, ensuring that chronic levels of these potential contaminants are avoided is crucial in that individual fish will simply avoid areas which may have excessive levels, sometimes rendering otherwise suitable habitat unusable. Elevated nitrates, however, may explain the previously inexplicable absence of salmonids from some otherwise suitable spring fed streams I am familiar with in the Nelson Marlborough Fish and Game region.

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<sup>19</sup> Hickey, CW and ML Martin (2009) **A review of nitrate toxicity to freshwater aquatic species Report No. R09/57 ISBN 978-1-86937-997-1** Prepared for Environment Canterbury, NIWA

79. In addition, recent work from the Cawthron Institute by Dr Woods and her colleagues has shown a relationship between instream nutrient levels and proliferation of potentially toxic cyanobacteria with consequences for water users and instream life. Dr Young and Professor Death refer to these issues in more detail in their evidence.
80. High nitrogen levels in the form of both ammonia and nitrate are also, detrimental to trout populations. Research has shown that high ammonia levels (2.55 mg/L at pH 7.5, and 1.44 mg/L at pH 8) kill salmonid eggs and increase adult mortality<sup>20</sup>. Maintaining concentrations of ammonia below 10 µg-N/L and nitrogen levels low enough to reduce the likelihood of periphyton proliferation should be enough to avoid toxic effects on salmonids, according to detailed investigations by the United States Environmental Protection Agency. Therefore Table 1a needs to be revised as in the evidence of Professor Death to ensure that ammonia and nitrogen levels do not exceed key thresholds to maintain salmonid habitats.

## Metals

81. High levels of heavy metals have been found to have lethal effects on several freshwater invertebrates in New Zealand<sup>21</sup>, including the cased caddis *Olinga feredayi*, the common mayfly *Deleatidium* spp, and the amphipod *Paracalliope fluviatilis* (Hickey 2000). Limiting toxicants to the 99% protection level as indicated in the ANZECC guidelines is recommended. This means in effect that the 99% protection level should be applied as in Schedule 5 in locations in which salmonid fisheries are located. I would disagree that, for example, no lowland catchment fed streams need protection more than the 90% level as this table currently implies. As noted above there are a number of salmonid fisheries in these areas which need a similar level of

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<sup>20</sup> US Environmental Protection Agency (1999) **1999 update of ambient water quality criteria for ammonia** Office of Water, U.S. Environmental Protection Agency, Washington D.C E.P.A-822-R-99-014

<sup>21</sup> Hickey, CW and Clements 1998 **Effects of heavy metals on benthic macroinvertebrate communities in New Zealand streams** *Environmental Toxicology and Chemistry* **17(11)**: 2338-2346

protection as the same fisheries in upland areas if these values are to be maintained.

### **Fish Passage**

82. This is the subject of more detailed evidence previously brought before ECan<sup>22</sup>, but the importance of maintaining fish passage between key parts of catchments remains crucial. Neither salmon nor trout fisheries can be sustained in waters lacking key habitats vital to the life history of the fish population, such as feeding and spawning areas. Brown and rainbow trout, as well as salmon, are known to undertake extensive migrations to complete their life cycles, as are most native fish. Messrs Millichamp and Webb refer in their evidence to the effects of lowered flows in the Ashley and Orari Rivers respectively on the likely future survival of the salmon fisheries there, for example.
83. Please note, as Dr Young advises in his evidence and as noted in my evidence above, that flow regimes include more than just minimum flows, but need to also reflect the effects of the whole flow regime on the biological requirements of fish and other aspects of instream biota
84. Coarse fish, by contrast to salmonids, are generally more tolerant of poorer water quality and can be abundant in isolated still waters, commonly artificial, or the slower moving reaches of lowland rivers.

### **Habitat Requirements of Game Birds**

85. Most gamebirds are waterfowl, which rely significantly but not absolutely upon wetland habitats, which are attractive because of their abundant nutrient resources and habitat diversity. Some waterfowl, such as pukeko and paradise shelduck, rely on wetlands for certain

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<sup>22</sup> Jamieson, D; M Bonnett, D Jellyman and M Unwin (2007) **Fish Screening: Good Practice Guidelines for Canterbury** NIWA Report 2007-092 Produced for the fish screening working party: Environment Canterbury, Fish and Game NZ, Irrigation NZ and Department of Conservation.

activities such as breeding or moulting, but can survive or indeed thrive away from wetlands at times. Others, such as shoveler ducks, are rarely seen away from open water or wetland habitats. As with salmonids, wetland areas used by waterfowl which are gamebirds are also utilised by other protected and unprotected wildlife.

86. Most waterfowl utilise different parts of wetlands for different purposes seasonally. During moulting, for example, many waterfowl species such as paradise shelduck lose their primary wing feathers and so cannot fly for a period of about a week. At these times such species tend to congregate in numbers on relatively undisturbed open water areas with suitable cover or roosting and loafing (and sometimes feeding) areas adjacent. Maintaining such areas is crucial to the survival of these species in some areas. Similarly, most waterfowl breed in spring and require undisturbed areas in or adjacent to wetlands to nest. Young broods require suitable feeding areas, preferably with abundant seed and invertebrate food sources and cover. They also require areas of open water for security from disturbance and predation. The most productive areas for wildlife have a complex mosaic of edge areas for feeding or nesting and cover or open water for refuge or feeding<sup>23</sup>. Such areas are able to be readily modified to enhance wildlife habitat, usually by water level manipulation, controlling weed species such as willows and controlling predators such as by trapping. Habitat enhancement for wildlife usually benefits a wide range of species, provided habitat diversity is provided.
87. Many of these wetland areas are also valuable habitats for other indigenous wildlife or native flora. Wetlands themselves are now a significantly depleted habitat throughout New Zealand, with estimates of their loss being about 90% of their original area. Canterbury is no exception, in that many of the areas of current farm or urban area in

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<sup>23</sup> eg Weller, M and Spatcher, CE (1965) **The role of Habitat in the Distribution and Abundance of Marsh Birds** Iowa State University Specific Science Reports No. 43.

the region's lowlands being former wetland (see attached figure). As the ECan website itself notes:

*"Within Canterbury, for example, in 1840 a massive complex of freshwater and saline wetlands extended across the low plains from the Waipara River to the Rakaia River. These have mostly been reduced to small, scattered fragments, surrounded by urban areas and farmland."*

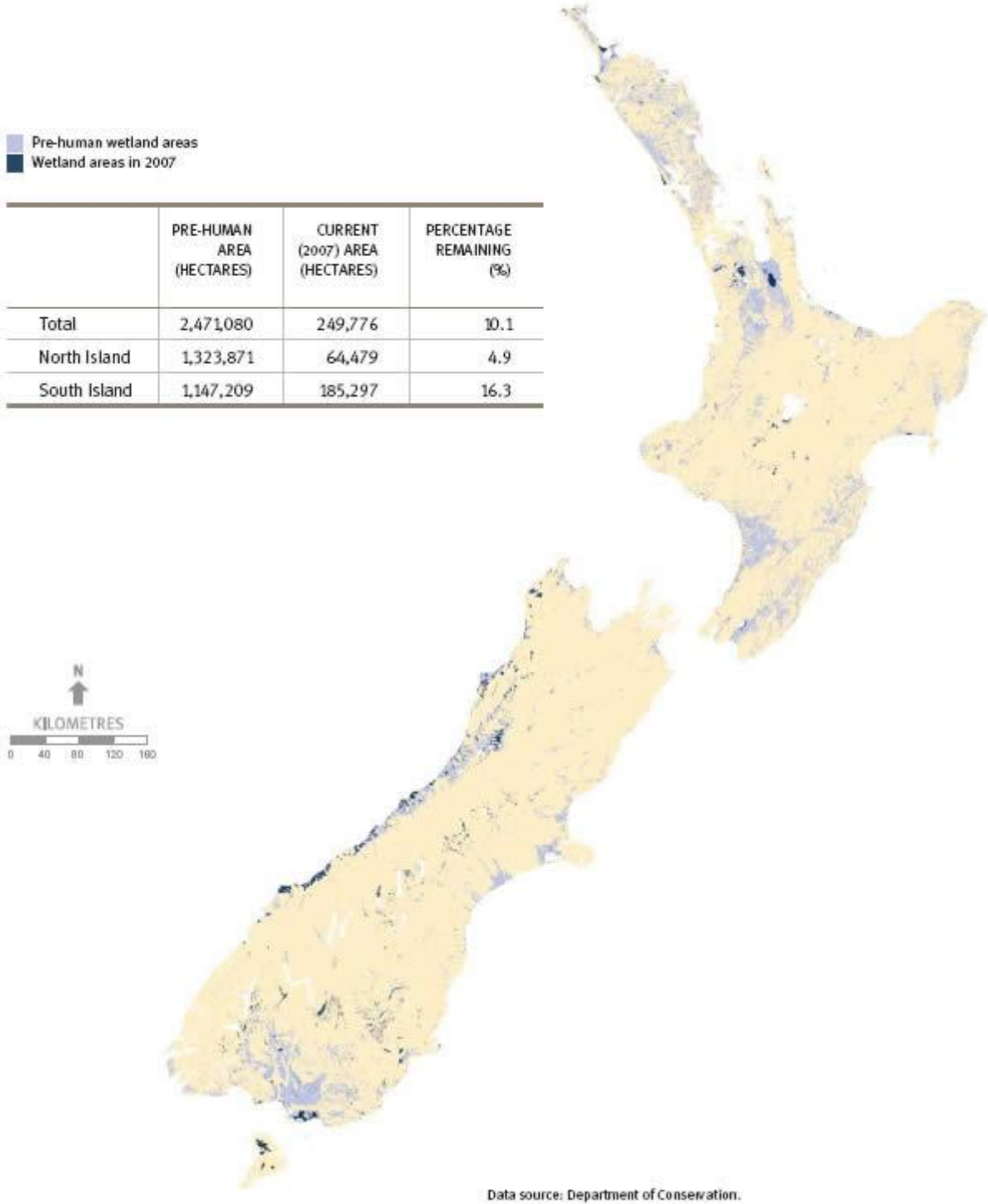


Figure 7 Comparisons of pre European wetland areas in purple (based on soil data) with those considered to remain in 2007 (dark blue). Source Ministry for the Environment State of the Environment Report 2007. Note formerly extensive lowland wetlands in various parts of the Canterbury Plains

88. Dr Gerbeaux has outlined much of the wetland management context in Canterbury and I endorse his evidence.
89. Detailed management of game and the hunting opportunity is covered by the provisions of the Wildlife Act 1953 and its subsidiary legislation, such as the Wildlife Regulations 1953 and annual Game Notices.
90. In an analogous fashion to sports fish, relevant habitats of gamebirds are worthy of consideration for protection in providing for the natural character of wetlands or indigenous species habitats under Section 6 of the Act.
91. The wetland provisions of earlier plans in Canterbury, including the NRRP provisions have recently been shown to be inadequate to protect wetlands in the region. The approaches of successive councils have been shown clearly in a recent investigations jointly undertaken by the Council, with assistance from Landcare Research and DOC<sup>24</sup>. This evaluated wetland loss in the region from pre European times and estimated this loss to be about 90%, based upon historic soils and remote sensing data. The vast majority of this loss was in lowland areas. Most of the remaining wetlands are now known to be associated with, and largely on the margins of, lakes and rivers. This suggests that the exclusion of such wetlands from the wetland provisions in the plan is at best ineffectual, and at worst a somewhat cynical approach. The few wetlands remaining are deserving of some recognition and provision, irrespective of their location.
92. The ECan report noted, further, that of the remaining 2004 distinct wetlands greater than 0.5ha in extent, some 102 (5%) showed significant further reduction (>25% reduction) in area over the period from about 1990 until 2010, with a further 42 (2%) having shown a

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<sup>24</sup> Pompei, M and P Grove (2010) **Historic and current extent of Canterbury freshwater wetlands, and recent trends in remaining wetland areas** Report R10/119 ISBN 978-1-877574-24-5 Environment Canterbury



minor reduction in area (<25% reduction) and only one (0.05%) having increased in area. Most of this reduction was due to new or further drainage, which ought to have required consent. It appears the Council's ability to ensure compliance with drainage rules is limited. Previous policy by the Council has been to maintain the 'gross' area of wetlands in its Regional Policy Statement; largely by working with landowners rather than through regulation. It appears that neither approach has been successful, although few of these activities had been through any kind of regulatory process. The report concludes:

*"Current programmes of public awareness and education, voluntary protection and Resource Management Act provisions have not halted loss of freshwater wetland habitats in the Canterbury Region. The objective of the Canterbury Regional Policy Statement (1998) to maintain or enhance the gross area of the region's wetlands has not been achieved."*

93. The change to general protection of wetlands rather than awaiting as yet non-existent schedules of different wetlands is long overdue and is applauded, given this has been Fish and Game's request of ECan for more than a decade.

## **CANTERBURY WATER BODY VALUES – SCHEDULE XX**

94. Schedule XX in the Fish and Game submission identifies a number of important values associated with Canterbury water bodies. These values relate to sports fishing for salmonids, gamebird habitats, white water recreation and jet boating. This evidence and that of Messrs Millichamp and Webb, supports the identification of these water bodies and their values, along with evidence provided by Fish and Game advocates. White water recreation and jet boating values in Schedule XX are supported by evidence from: White Water New Zealand; Jet Boating New Zealand Inc.; BugSports Club Inc; and the Whitewater Canoe Club.
95. The values and water bodies in Schedule XX have been revised somewhat since the original Fish and Game submission and these additions provide a more comprehensive assessment. The revised version is attached as **Appendix 5** to my evidence. Additions are

primarily due to a more finely scaled breakdown of catchments into specific water bodies in order to provide future users of the Schedule with more specific detail for management and planning purposes. The values in the originally submitted Schedule XX have also been revised to provide clear criteria for water body characteristics such as significance, amenity value and priority for spawning values. In relation to Fish and Game habitat, each of the three Fish and Game regions in Canterbury assessed these water bodies through a systematic process to identify the respective values for each.

96. This process utilised the extensive experience and knowledge of Fish and Games staff in relation to field work such as habitat assessments and observations, drift diving surveys, electric fishing monitoring, fish trapping, hatchery operations, aerial and on-foot spawning counts, aerial fish counts and game bird habitat projects. Fish and Game staff have also applied their extensive understanding of related research along with expertise gained by working with other regions and other Fish and Game related agencies in other parts of the world.
  
97. In North Canterbury, the officers collectively assessed each water body to decide on the value selections made in Schedule XX; Central South Island and Nelson Marlborough also relied on the extensive experience of staff. These decisions were also based on available research, expert evidence and management plans, such as the National Angler Survey and other angler surveys, Sports Fish and Game Management Plan, Sea Run Salmon Management Plans and the Game Bird Management Plans.
  
98. The development of values in Schedule XX was closely associated with Hayward et al., 2009 "Purposes of Management" (POM), which has been adopted and adapted by Fish and Game into the following 8 freshwater objectives used in Table 1a. These categories are listed below:
  - 1 Ensure diverse and abundant aquatic ecosystems of indigenous flora and fauna

- 2 Protect habitat of salmonids (trout or salmon)
- 3 Maintain amenity values
- 4 Ensure water quality is safe for contact recreation
- 5 Ensure water is suitable for secondary contact recreation
- 6 Safe guard Ngai Tahu cultural values including; mauri, mahinga kai, wahi tapu and wahi taonga
- 7 Ensure water is suitable for stock drinking water supply
- 8 Support the functioning and health of estuaries and coastal lagoons

99. These freshwater objective (FO) categories can be linked to Schedule XX as shown below. These linkages are based on the evidence provided by those proposing Schedule XX and the process for assessment of river characteristics as noted above:

WCO (FO1, 2, 3, 8)

Outstanding Significance (FO 2, 3, 8)

Regional Significance (FO 2, 3, 8)

Local Significance (FO 2, 3, 8)

High Naturalness (FO 2, 3, 8)

Primary Spawning (FO 2)

Secondary Spawning (FO 2)

Regional Iconic Backcountry (FO2, 3)

White Water Recreation (FO 3, 4, 5, 8)

Jet Boating (FO 3, 4, 5, 8)

100. The basis for considering the recreational significance of each of these water bodies for fishery values is set out below:

- a. Local

- i. The majority of participants in this activity are from the immediate locality and/or fewer than 1000 user days occur each year.
- b. Regional
  - i. The majority of participants in this activity are from within the region rather than just the immediate locality and/or more than 1000 but fewer than 5000 user days occur each year.
- c. National
  - i. At least 20% of the participants in this activity have come from areas outside the region to participate in the activity in this location and/or more than 5,000 user days per annum.
- d. International
  - i. At least 40% of the participants in the activity have come from overseas to participate in the activity in this location and/or more than 10,000 user days per annum.
- e. High Naturalness
  - i. This value relates to waterbodies that are still in a predominantly unmodified natural state, having minimal human interference in terms of water quality and natural flow regimes. These rivers exhibit pristine conditions relative to other human influenced or modified rivers in Canterbury. These water bodies afford high levels of amenity and habitat quality. This definition was created by Fish and Game in the absence of a definition in the plan.

- f. Primary Salmonid Spawning
  - i. This value relates to waterbodies containing intensive spawning grounds for salmonids. These are the most productive spawning areas and are critical for the maintenance and enhancement of salmonid populations. The level of significance and habitat features of these spawning areas warrants the highest level of protection achievable.
- g. Secondary Salmonid Spawning
  - i. This value relates to waterbodies containing more extensive spawning grounds for salmonids, with a secondary ranking compared to primary spawning rivers. This is partly due to the variability in specific spawning locations from year to year depending upon a river's flow regime; unlike primary areas in which tend to be consistently utilised for spawning. These rivers are also critical for the maintenance and enhancement of wild salmonid populations. The level of significance and habitat features of these spawning areas warrants a high level of protection.
- h. Regional Iconic Backcountry
  - i. This value relates to waterbodies that provide special backcountry experiences for anglers tied very much to the quality of the overall experience and amenity afforded to anglers. They have iconic status at a regional and sometimes national level and are typically associated with high country locations and the head waters of Canterbury rivers. These locations are not graded on angler use but on the motivations and values anglers associate with having access to these more remote wilderness locations. Protecting the special characteristics of these water bodies plays an important

role in protecting the overall amenity and downstream quality of many Canterbury salmonid fisheries.

i. Game Bird Habitat

This value relates to the importance of sport game birds in Canterbury particularly in terms of recreation amenity. Game bird hunting is a well-established recreational pastime with a strong following in Canterbury. The game bird habitats shown in this Schedule have national and regional levels of significance and provide for the life supporting requirements of these birds at the relevant stages in their lifecycle.

101. I developed these criteria and thresholds initially in the Nelson Marlborough Fish and Game region and subsequently tested them on the full data set of the 1,150 rivers and lakes of the National Angler's Survey data from the 1994-5 and 2001-2 seasons<sup>25</sup>. The NAS is one of the few national data sets of the use of water bodies which is available for this sort of analysis. I was able to assess the significance of water bodies for this dataset, which is summarised in Figure 3 below. Note that a national dataset is required to assess waters of national significance. It is conceivable that different thresholds could be, and indeed probably have been, chosen within a region or between regions as to regional significance. However, when taken from a national perspective for sports fish and game at least, it would seem inappropriate to have each region determine an entirely different basis for their assessment of significance. This data is offered to assist ECan in determining what thresholds might be appropriate to its own circumstances.

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<sup>25</sup> Deans, NA (2005) **Sports Fisheries of National Importance**. Internal paper for Fish and Game NZ for the Sustainable Development Programme of Action Waters of National Importance.

### Significance of NZ Waters for sports fishing

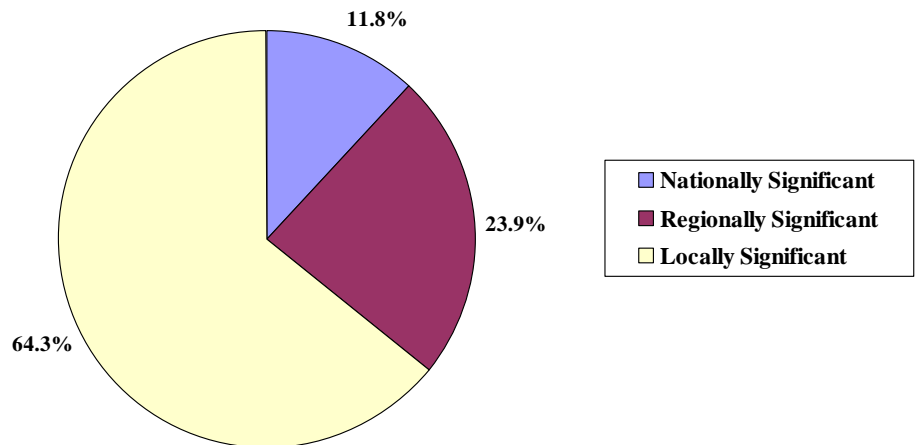


Figure 8 Analysis of National Angler's Survey Data of 1150 sites nationally to establish proportions of water bodies of different levels of significance for sports fishing. From Deans (2005).

102. Gamebird hunting is intrinsically different from fishing in that most of the activity is undertaken in a large number of relatively small wetlands; amounting to hundreds of sites, mostly on private land, across Canterbury. Hunters have traditionally been strong advocates for the protection of wetlands as key habitats for the species being hunted. Many hunters and landowners, sometimes jointly, protect their wetlands to enable and provide for wildlife habitat and hunting opportunity. Even key wetland habitats and hunting areas such as Te Waihora/Lake Ellesmere or the Wainono Lagoon in Canterbury support a relatively small proportion of the suitable hunting opportunities, even if their habitat and recreational values are high. It is therefore important to maintain many wetlands across the landscape to support this form of recreation, rather than just protection of an iconic view. This is not to say those key wetlands are unimportant; where they can and should be recognised and provided for in this plan this is appropriate, but just that this is necessary but not sufficient for the ongoing viability of these wildlife populations and recreational opportunities

103. White water recreation and jet boat recreation values are have been defined by the representative organisations above. They will be explaining the basis for these value definitions in their evidence.
104. Fish and Game's evidence has focused on the amendments required to Table 1a, and the inclusion of Hayward et al's "Purposes for Management" as its "Freshwater Objectives" and environmental outcomes. The same approach should be adopted for table 1b in respect of Outcomes for Canterbury Lakes (See Hayward's table 7.2, attached to Professor Death's evidence as Appendix 3). The application of these freshwater objectives is central to Fish and Game's proposition that freshwater objectives in the plan are defined as environmental limits as opposed to "aspirations" as suggested by ECan in its section 42a response to our original submission.
105. In Fish and Game's original submission, Tables 1a and 1b suggested amendments included reference to further numerical limits such as "soluble inorganic nitrogen" and "clarity". We have now recommended these additional freshwater objectives or environmental standards be included in the "water quality standards for waters not classified as natural" table in Schedule 5. While our evidence has focused predominantly on Table 1a, we would like to see the standards we recommended for Table 1b also transferred to Schedule 5, consistent with the level of standards requested for Table 1a.

### **Relationship between Regional and Zone Plans**

106. The Land and Water Plan is regarded as an interim measure until such time as more detailed catchment or zone based plans are developed. The Canterbury Regional Council must meet certain obligations under the NPS on Freshwater for the whole region, not just its separate parts, or those parts separately. For example, there is a requirement to maintain or enhance 'overall' water quality in the region. This cannot be assessed in different ways within different parts of the region if there is to be a proper regional approach. These



plans should operate as a planning cascade, or the 'tail will wag the dog'.

107. While there is merit in addressing greater detail in catchment based plans and seeking the involvement of local interests through collaborative processes, there is a problem for the consistency and effectiveness of freshwater management in the whole region if the catchment-based plans take significantly different approaches from one another or this Land and Water Plan. The administrative and decision making body is the regional council, not a series of zone committees; even if what is produced by those zone committees is given some weight through the Canterbury Strategic Water process. In addition, it seems appropriate that as much information as possible is incorporated into this Land and Water Plan, provided it can be justified, as there is both efficiency and consistency in undertaking this.
108. Fish and Game has provided information to ECan on the fisheries and wildlife values of many of the region's water bodies on a number of occasions over a considerable period, such as the information Mr Webb refers to in his evidence. None of the information provided in the Fish and Game submission or in the evidence to this hearing is inconsistent with that earlier information. As the protection of these habitats cannot be achieved by applying for consents, the only way of ensuring an appropriate degree of protection of these habitats and access to them for anglers and hunters is by way of integrated, effective and comprehensive provisions of a Water Conservation Order or regional plan. Therefore it should be helpful to that regional plan if there is as much specificity as possible. This specific information is reiterated in my evidence and that of my colleagues and is sought for inclusion in revised versions of Schedule XX and Table 1a.
109. The other issue is the extent to which decisions would be made to further develop water resources before any limits were in place to address the cumulative effects on water resources of resource

development. The evidence of Messrs Millichamp and Webb sets out in some detail the consequences for Canterbury water bodies of the on-going cumulative effects of on-going water allocation and land use intensification the absence of limits to resource use. This Land and Water Plan must set limits now if it is to be effective in achieving the requirements of the National Policy Statement on Freshwater by ensuring decision-makers to not exceed allocation limits or breach water quality standards.

110. It is crucial that limits are set at levels which ensure the protection of the most critical or sensitive of the relevant values associated with a particular water body. If the limits are set too low, then the likelihood of maintaining habitat values is compromised. I am surprised that the detailed work undertaken for the Natural Resources Regional Plan, such as the reports by Norton and Snelder (2008) and by Hayward et al (2009), have not been directly incorporated into this plan. In resource management terms, it seems that recently commissioned relevant information for better water resource management is being lost or overlooked. This does not augur well for the achievement of better or even adequate water and habitat quality in Canterbury.

### **Classification Approach**

111. Environment Canterbury has chosen to use the NIWA Rivers Environment Classification ("REC") approach as the basis for their river hierarchy, at least on an interim basis, termed "Management Units" in table 1a.. I understand this to be based originally on the analysis undertaken by ECan staff that this approach would provide appropriately for the values associated with each class of water bodies, recognising that not all water bodies are the same. It is also relatively objective and can be used when there is an absence of information as to the values associated with particular water bodies.
112. Fish and Game has taken a complementary approach, as we have reasonably good information on the water bodies of value for different fisheries and wildlife habitats, and the recreational amenity derived

from or dependent upon them. Schedule XX provides, in summary form, an exposition of this information in one place by particular water body, rather than generic water body class. Ideally other similar in- or out of- stream values would also be listed to both inform sub-regional processes and to ensure the approach to provide for these is consistent across the whole region.

### *Conway River flows*

113. An example is through the recent changes to flow provisions in the Conway River catchment. Presumably due to reference to Heyward et al report and as a lowland catchment-fed river according to the ECan REC classification, the relevant purpose for management was deemed to be amenity value rather than salmonid habitat. Fish and Game was unable to convince the Commissioners in that case that the amenity value of trout fishing is crucially dependent upon maintaining the habitat of trout in that catchment; there will be no trout fishing without trout habitat. So the nominal protection of the amenity value was unable to be achieved without providing for the habitat requirements of the fish on which that amenity depends. In this case, ECan hydrologists recommended significantly reducing the river's minimum flow along most of its length of some 15 km where it is suitable for trout fishing, without provision for adequate flow for trout habitat, in order to increase flows in the lowest few hundred metres of the river into its hāpua. This was based largely upon a review of the hydrological records for the catchment, rather than considering or providing for the values present in the water body. It provides a good example of the difficulty in using the REC as a blunt instrument to act as a surrogate for values and their protection.
114. No detailed analysis was undertaken of the instream flow requirements for trout in this catchment as it was, inappropriately in my view, determined that trout habitat was irrelevant in that case. While the exact flow requirements for trout have not been established through instream flow incremental modelling ("IFIM") or a similar approach, I did analyse the hydraulic radius (a measure from hydrological data of water depths and velocities from gauged river

flows) for the data available from ECan. This suggested that reducing the flows below those which had been measured (usually more than 1000 l/second) would seriously reduce the likely habitat available for trout in those sections at least. Given the previous flow regime has continued to provide for the trout fishery, I consider that a conservative approach would be to retain the flow regime which had previously supported the trout fishery in that river, rather than a significant reduction based upon reanalysis of hydrology, not instream flow needs.

115. Fish and Game did not appeal that decision on the basis that this Land and Water Plan would provide the opportunity to review this minimum flow and reinstate a modification to the former regime as set out below throughout the entire 15km of the lower river:

*Conway River between Charwell River confluence and SH 1 bridge*

*1 September - 30 April: 1000 [l/sec]*

*1 May – 31 August: 2100*

*1 September – 30 April:*

*All takes reduce by 25% if flow is 1201 - 1300*

*All takes reduce by 50% if flow is 1101-1200*

*All takes reduce by 75% if flow is 1001 - 1100*

116. There is mostly an alignment between the Hayward et al table of the water quality requirements for salmonids and the REC categories, except for those in the hill fed lower and spring fed plains streams. Some of these streams are indeed trout fisheries, or at least have been in the recent past, which are listed in Schedule XX, such as the Conway, as mentioned above, the Avon, the LII and the lower Selwyn, for example.
117. At present this classification does not provide a water quality standard sufficient to support the habitat for trout in these currently degraded waters. Inclusion of specific trout fisheries such as these in Schedule XX is intended to identify those for which better and more appropriate water quality and quantity limits are required to protect those species' habitats, to be imposed at the development of relevant catchment chapters. If these fisheries are to be sustained or restored in the long term, higher water quality targets such as a higher QMCI than of 4, will

be required in future. This approach may indicate relative priority for restoration of water quality, where appropriate.

118. Fish and Game's evidence has focused on the amendments required to Table 1a, and the inclusion of Hayward et al's "Purposes for Management" as its "Freshwater Objectives" and environmental outcomes. The same approach should be adopted for table 1b in respect of Outcomes for Canterbury Lakes (see Hayward's table 7.2, attached to Professor Death's evidence as Appendix 3).
119. In summary then, the REC approach is helpful across such a large and broad a region as Canterbury, but is something of a blunt instrument, not always capable of recognising the specific values of or requirements for the maintenance of those values. Schedule XX is intended to identify the values associated with particular waterways and their relative significance, to help determine what standards or limits ought to apply to those waters.

### **Life supporting capacity**

120. Although Section 5 refers to the safeguarding of life supporting capacity of water, inter alia, there is no definition of this in the RMA. The question arises as to which life and to what extent should it be supported. The life being supported should pertain to the relevant environment. It makes no sense that water resources, for example, are degraded to no longer provide for aquatic life to be supported to allow for the livelihood of people, or their stock, for example, as terrestrial organisms. There can be little doubt that support for the aquatic ecosystem generally ought to be provided, although this does not help in defining what specific life or lives should be provided for. It also follows that if there are natural conditions that do not allow the support of particular organisms (e.g. too high a water temperature naturally), that it would be unreasonable to expect the habitat for those organisms to be provided.

121. Assuming that a regional council is obliged to meet this test in a regional plan, it must define what life supporting capacity is required to be safeguarded in any general or particular situation. The REC as a means of classification does not define this well as it is based on a geomorphological and hydrological, rather than a biological, assessment of different water bodies. So REC categories must act as a surrogate for particular life supporting capacity. In most cases, where a particular life is identified, the species most valued and sensitive to change may become the indicator of life supporting capacity generally. This might be a particular amount of growth or species of periphyton or aquatic macrophyte on the substrate, or index of macroinvertebrates present, or the presence of a particular fish or wildlife species, or its habitat or life stage. If the most sensitive species is chosen and is measurable as an indicator, it may also provide for other species. As noted elsewhere in this evidence, salmonids are sensitive, widespread, highly valued and sought after (by anglers at least), not subject to biogeographical constraints as are some native fish species, are relatively visible and are relatively well studied, so can often either define life supporting capacity, or contribute to a metric of many species which are able to identify this. In general, it would be appropriate to use a suite or index of species to define life supporting capacity as there may be various reasons why a particular species may be absent or poorly represented in a particular area.
122. It is noted on page 120 of the Section 42a report that the Fish and Game submission that the definition of ecological health be deleted and replaced by reference to life supporting capacity is supported. However although the former is deleted the reference to life supporting capacity is not included in the definitions, which is probably unhelpful. I would recommend that a definition of life supporting capacity such as: 'retaining the ability over time to sustain the most sensitive of those species defined which characterise the water body type or provide for the identified values of those waters'. Professor Death also refers to this in his evidence.

## Groundwater Temperature

123. Page 289 of the officer's Section 42a report refers to the relief sought by Fish and Game in respect of the effects of temperature from groundwaters used for thermal exchange. At present the officers' report does not acknowledge the concern of Fish and Game that waters used for thermal exchange could have consequences on adjacent surface waters. While this may be unlikely, it could readily be addressed by making the following change to the recommended rule:

Recommendation R5.105

124. That Rule 5.105 be amended as follows:

*5.105 The non-consumptive taking and using of groundwater, including for heating or cooling purposes, and the associated discharge to groundwater, is a permitted activity provided the following conditions are complied with:*

*1. The discharge of the groundwater is to the same aquifer or groundwater source as the abstraction, and the discharge is within 50 m of the abstraction point;*

*2. The use of the water is for non-commercial domestic purposes; and*

*3. No contaminants, other than water of the same or different temperature, enter the Groundwater; and there shall be no increase in temperature of any surface waters in the vicinity above threshold temperatures established in Table 1a.*

## Gravel

125. As noted above, fish habitats can be affected by changes to gravel management. Fish and Game has identified waters of importance as trout and salmon fisheries and/or as spawning waters in Schedule XX or a revised Schedule 17. In order to ensure that these waters are not adversely affected by activities in river beds or gravel extraction as noted in the submission, the following addition to rule 5.125 is requested:

*1. The activity is not undertaken in a salmon, inanga or trout spawning site listed in Schedule 17 or water body of significance in Schedule XX;*

## Damming and Diversion

126. Case law suggests that any structure which diverts water is a dam. This is sometimes unhelpful as the effects of 'instream' diversions are

different to those diversions which impound or change the bed level of water. Any structure which crosses the entire bed of a river or a channel will have the effect of damming that river or channel by changing the invert level of the water in it. The effects on fish habitat and fish passage of such dams can be significant and should be treated differently from the effects of diversion structures. The following amendments to rule 5.128 are sought to recognise the habitat and access consequences of river damming, which are additional to those of in channel river diversions. Many issues of concern can be addressed and reduced by ensuring that the timing of any works do not coincide with key habitat periods, such as nesting for birds or spawning for fish:

*5.128 The damming of water in the bed of a river and the constructing, using, altering, maintaining and operating dam structures within the bed of a river, and the use of land to store water, including any associated impounding of water outside the bed of a river or natural lake is a permitted activity, provided the following conditions are met:*

*1. For the impounding of water outside the bed of a river or natural lake:*

*(a) the volume of water stored or impounded is less than 20,000m<sup>3</sup>;*

*(b) the maximum depth of water is less than 3m; and*

*(c) if the volume of water impounded is greater than 1,000m<sup>3</sup>, the design and construction*

*of the dam is certified by a chartered professional engineer (civil); and*

*2. For the damming of water in the bed of a river and the constructing, altering, using, maintaining and operating of dam structures within the bed of a river:*

*(a) the volume of water impounded is less than 5,000m<sup>3</sup>;*

*(b) the maximum depth of water is less than 3m;*

*(c) the dam does not impound the full flow of the river;*

*(d) any existing passage of and habitat for fish or wildlife is not impeded or adversely affected;*

*(dd) physical and legal access to and along water bodies is retained and/or provided;*

*(e) the damming of water does not cause water flow to fail to meet any limits in Sections 6 – 15 or fall below the minimum flow for the surface water body if then water body is subject to a minimum flow as set out in Sections 6 – 15;*

*(f) the dam is not located in a river listed as a high naturalness river in Sections 6 – 15 or in the mainstem of any river; and*

*(g) the damming does not prevent water being taken by any domestic or stock water supply, or reduce the reliability of supply of any existing legally authorised water take.*



### **Riparian margins**

127. It is interesting that on the basis of two submissions advising the arbitrary nature of 20 and 10m riparian margins for hill and high country and lowland country respectively, the Section 42a officers' report recommends halving these, which is presumably also arbitrary. I agree that the width of a riparian margin depends upon the purpose for which it is proposed; its location and the type of activity which is being limited in that zone. It is difficult to provide a single riparian width which would be appropriate to all situations.
  
128. I was involved in the process which identified three classes of riparian margins for the two resource management plans in Marlborough, which identified and reached agreement between parties for riparian margins of 20m for larger rivers which require flood control and public access; 10m for smaller rivers and wetlands with habitat value, and riparian margins of 5m for those small streams where water quality was being adversely impacted by stock access.
  
129. This is a matter which has been considered exhaustively in the development and evaluation of the National Environmental Standard for Plantation Forestry, with considerable debate between scientists and practitioners of forest and earthwork operations. That process recommended the general provision of a 10 m margin between water bodies and forest operations except for more sensitive areas for which a 20 m margin was proposed. The detailed proposal is as follows:
  - a. Riparian setbacks for afforestation, replanting and earthworks:
    - i. 5 m buffer from streams where the bankfull channel width is less than an average of 3 m or from wetlands;
    - ii. 10 m buffer from streams with a bankfull channel width averaging more than 3 m, or from lakes
    - iii. 20 m buffer from regionally significant wetlands and from any quarrying;
    - iv. 30 m buffer from the Coastal Marine area.

130. Harvesting of trees was not to be operated within 5m of any waterbody, although occasional sites of access across (at right angles to) riparian area were permitted.
131. I am uncertain of the technical evidence which supported the submissions which led to the changes recommended in the Section 42a report, but doubt this was robust. I would recommend reinstating the riparian margins as originally promulgated in the plan, which accords more closely with the analysis in the Plantation Forestry NES. While this NES has not yet been completed, the issue of riparian setbacks has been resolved between the parties.

### **Timing of Activities**

132. Rule 5.5 is recommended to be altered by the addition of the word 'timing' as a matter to consider for a restricted discretionary activity. This is because some activities, particularly those in river beds, may have minimal effects if undertaken at times of year when there are no birds nesting or fish spawning in the river or its margins, or occurring during the closed season for certain recreational activities such as fishing. At other times of year, however, the same activities might cause significant adverse effects on biota or on recreational opportunities which could have been avoided by undertaking the activity at another time of year. This approach is common practice in many other regions; such as Tasman and Marlborough, for example.

### **Summary**

133. Fish and Game Councils' are the statutory managers of sports fish and game birds, in the recreational interest of anglers and hunters who pay for that management.
134. This Land and Water Regional Plan must recognise and provide for specific waters valued for sports fish and gamebirds, their habitats and for the recreation derived from them.

135. Relevant provisions of the legislation, sports fish and game management plans, discussion of the species and their habitat requirements are outlined to provide background to inform the provisions Fish and Game is seeking are included in the Land and Water Plan.

**Neil Alastair Deans**

**4 February 2013**

**Appendix 1. Provisions of the Conservation Act 1987 relevant to Sports Fish and Game Bird management, with key aspects underlined**

**“17L. SPORTS FISH AND GAME MANAGEMENT PLANS**

*(1) The purpose of a sports fish and game management plan is to establish objectives for the management of sports fish and game, or both, within any region or part of any region.*

*(2) Each Fish and Game Council shall prepare for approval by the Minister such sports fish and game management plans as are necessary for the management of sports fish and game within its area of jurisdiction.*

*(3) Nothing in any sports fish and game management plan shall derogate from—*

*(a) Any provision in this Act or any other Act; or*

*(b) Any policy approved under this Act or any other Act in respect of the area to which the plan relates, or any part of that area; or*

*(c) Any provision in any conservation management strategy or conservation management plan or freshwater fisheries management plan.*

*(4) When preparing a draft sports fish and game management plan, the Fish and Game Council shall—*

*(a) Have regard to the sustainability of sports fish and game in the area to which the plan relates; and*

*(b) Have regard to the impact that the management proposed in the draft is likely to have on other natural resources and other users of the habitat concerned; and*

*(c) Include such provisions as may be necessary to maximise recreational opportunities for hunters and anglers.*

**17M. PROCEDURE FOR PREPARATION, APPROVAL, REVIEW, AND AMENDMENT OF SPORTS FISH AND GAME MANAGEMENT PLANS**

*(1) Every draft sports fish and game management plan shall be prepared by a Fish and Game Council in the manner provided in subsection (2) of this section.*

*(2) The following provisions shall apply to the preparation and approval of sports fish and game management plans:*

*(a) The Fish and Game Council—*

*(i) Shall publish a notice of the draft plan either in some newspaper circulating in the area in which the subject-matter of the notice is situated or, if the draft is of national importance, at least once in each of 5 daily newspapers published in*

*Auckland, Hamilton, Wellington, Christchurch, and Dunedin, respectively; and*

*(ii) Shall give notice of the draft plan to the Director-General and, so far as is practicable, to representatives of the appropriate iwi authorities, and to the appropriate regional councils and territorial authorities within the meaning of the Local Government Act 2002; and*

*(iii) May give such further notice of the draft plan as the Fish and Game Council thinks fit; and*

*(iv) Shall, in every notice under this paragraph, invite persons or organisations to send to the Fish and Game Council written submissions on the proposal before the date specified in that behalf in the notice, being a date not less than 40 working days after the date of the publication of the notice; and*

*(v) Shall consult with such other persons or organisations, in such manner, as the Fish and Game Council considers practicable and appropriate; and*

*(vi) Shall give full consideration to any submissions and opinion made known to the Fish and Game Council:*

*(b) Every notice under paragraph (a) of this subsection shall state that the draft plan is available for inspection at the places and times specified in the notice:*

*(e) of this subsection and a written statement of any matters of content on which the Director-General and the Council are unable to agree:*

*(g) The Minister shall approve the draft or send it back to the Fish and Game Council for further consideration (c) From the date of public notification of a draft plan until public opinion of it has been made known to the Fish and Game Council, the draft shall be made available by the Fish and Game Council for public inspection during normal office hours, in such places and quantities as are likely to encourage public participation in the development of the proposal:*

*(d) The Fish and Game Council shall give every person or organisation who or which, in making any submissions on the draft, asked to be heard in support of his or her or its submissions a reasonable opportunity of appearing before a meeting of representatives of the Fish and Game Council:*

*(e) The Fish and Game Council shall prepare a summary of the submissions received on the draft and public opinion made known about it:*

*(f) The Fish and Game Council shall send the draft to the Minister with the summary prepared under paragraph (e) before approving it.*

*(3) The Fish and Game Council may at any time review or amend any sports fish and game management plan.*

*(4) Subject to subsection (6) of this section, the review of any sports fish and game management plan and amendments shall be dealt with under subsection (2) of this section, which shall apply with any necessary modifications.*

*(5) The following provision shall also apply in relation to the review of any sports fish and game management plan:*

*(a) Any sports fish and game management plan may be reviewed in whole or in part:*

*(b) A sports fish and game management plan shall be reviewed as a whole by the Fish and Game Council not later than 10 years after the date of its approval:*

*(c) The Minister may, after consultation with the Fish and Game Councils affected, extend that period of review.*

*(6) Where the proposed amendment of any sports fish and game management plan is of such a nature that the Fish and Game Council considers that it will not materially affect the objectives or policies expressed in the plan or the public interest in the area concerned, the amendment shall be dealt with under paragraphs (e) to (g) of subsection (2) of this section, which shall apply with any necessary modifications.*

#### **17N. EFFECT OF GENERAL POLICIES, CONSERVATION MANAGEMENT STRATEGIES, AND MANAGEMENT PLANS**

*(1) Every statement of general policy approved under section 17B(3)(m) or section 17C of this Act, every conservation management strategy, and every conservation management plan, freshwater fisheries management plan, and sports fish and game management plan shall have effect on and from the date on which it is approved, or on such later date as may be specified in that behalf in the statement or strategy or plan.*

*(2) No such statement or strategy or plan shall restrict or affect the exercise of any legal right or power by any person other than the Minister or the Director-General or any Fish and Game Council.*

*(3) [Repealed]*

*(4) Every such statement, strategy, and plan shall be available for public inspection during ordinary office hours at the Department's Head Office, and at such other places as the Director-General thinks its public availability is desirable.*

*(5) Sports fish and game management plans, and policies relating to sports fish and game that are general policies or are established by the New Zealand Fish and Game Council, shall be available at the offices of the New Zealand Fish and Game Council and the Fish and Game Councils affected by them.*

*(6) Where any such strategy or plan or any review or amendment of any such strategy or plan is approved, the Fish and Game Council that prepared, reviewed, or amended the sports fish and game management plan, or the Director-General in the case of any other strategy or plan, must give public notice of the approval, specifying the offices or places at*

*which the strategy or plan, or reviewed or amended strategy or plan, can be inspected; and section 49(1) of this Act applies as if the notice were required to be given by the Minister.*

## **26C Functions of New Zealand Fish and Game Council**

- (1) *The functions of the New Zealand Fish and Game Council shall be—*
  - *(a) to develop, in consultation with Fish and Game Councils, national policies for the carrying out of its functions for sports fish and game, and the effective implementation of relevant general policies established under the Wildlife Act 1953 and this Act:*
  - *(b) to advise the Minister on issues relating to sports fish and game:*
  - *(ba) to co-ordinate the preparation and recommendation, for the Minister's approval, of Anglers Notices and notices for game seasons; to advise the Minister in relation to such matters; and to publish in the Gazette Anglers Notices and notices for game seasons:.*
  - *(c) to participate, with the Director-General and other interested parties, in the development of a research programme promoting the management of sports fish and game:*
  - *(d) to oversee the electoral system by which members of Fish and Game Councils are elected:*
  - *(e) to recommend to the Minister an appropriate fee for fishing and hunting licences, after having regard to the views and recommendations of Fish and Game Councils:*
  - *(ea) to recommend to the Minister fees for game hunting guide licences and sports fishing guide licences, after having regard to views and recommendations of Fish and Game Councils:*
  - *(f) to determine, in consultation with Fish and Game Councils, the amount of the levy payable by Fish and Game Councils to the New Zealand Fish and Game Council, from licence sales, for—*
    - *(i) the administration of the New Zealand Fish and Game Council; and*
    - *(ii) redistribution between Fish and Game Councils; and*
    - *(iii) advocacy and research:*
  - *(g) to advocate generally and in any statutory planning process the interests of the New Zealand Fish and Game Council and, with its agreement, of any Fish and Game Council in the management of sports fish and game, and habitats:*
  - *(h) to provide regular reports to Fish and Game Councils:*

- (i) to liaise with the New Zealand Conservation Authority:
- (j) to audit the activities of Fish and Game Councils:
- (ja) to recommend to the Minister, after having regard to the views and recommendations (if any) of Fish and Game Councils and the New Zealand Game Bird Habitat Trust Board, an appropriate fee in respect of any game bird habitat stamp and the form of such stamps:
- (jb) to sell or arrange the sale of, in New Zealand or outside New Zealand, game bird habitat stamps and associated products:
- (k) to perform such other sports fish and game functions as the Minister may require.

(2) The New Zealand Fish and Game Council shall have such other functions as are conferred on it by or under this Act or any other Act.

#### 26Q Functions of Fish and Game Councils

- (1) The functions of each Fish and Game Council shall be to manage, maintain, and enhance the sports fish and game resource in the recreational interests of anglers and hunters, and, in particular,—
  - (a) to assess and monitor—
    - (i) sports fish and game populations; and
    - (ii) the success rate and degree of satisfaction of users of the sports fish and game resource; and
    - (iii) the condition and trend of ecosystems as habitats for sports fish and game:
  - (b) to maintain and improve the sports fish and game resource—
    - (i) by maintaining and improving access; and
    - (ii) by maintaining the hatchery and breeding programmes, where required for stocking or restocking the sports fisheries and game habitat; and
    - (iii) by formulating and recommending to the New Zealand Fish and Game Council conditions for fishing and game seasons; and
    - (iv) by ensuring that there are sufficient resources to enforce fishing and hunting season conditions; and
    - (v) by undertaking such works as may be necessary to maintain and enhance the habitat of sports fish and game, subject to the approval of the Minister, the land



owner, or the administering authority, as the case may require:

- (c) to promote and educate—
  - (i) by defining and promoting ethical standards of behaviour to be followed by anglers and hunters; and
  - (ii) by promoting recreation based on sports fish and game; and
  - (iii) by keeping anglers and hunters informed on matters affecting their interests:
- (d) in relation to costs,—
  - (i) to assess the costs attributable to the management of sports fish and game; and
  - (ii) to develop and recommend to the New Zealand Fish and Game Council appropriate licence fees to recover costs and game bird habitat stamp fees; and
  - (iii) to represent the region's interests with the New Zealand Fish and Game Council in the determination and distribution of levies on licences:
- (e) in relation to planning,—
  - (i) to represent the interests and aspirations of anglers and hunters in the statutory planning process; and
  - (ii) to formulate and adopt an annual operational work plan; and
  - (iii) to prepare draft sports fish and game management plans in accordance with this Act; and
  - (iv) to identify and recommend to the New Zealand Fish and Game Council the region's sports fish and game requirements for research; and
  - (v) to implement national policy determined by the New Zealand Fish and Game Council; and
  - (vi) to liaise with local Conservation Boards; and
  - (vii) to advocate the interests of the Council, including its interests in habitats:
- (f) to issue—
  - (i) licences to hunt or kill game, and game bird habitat stamps, in accordance with the Wildlife Act 1953 and any regulations made under it; and
  - (ii) licences to take sports fish, in accordance with this Part and any regulations made under this Act; and

- *(iii) game hunting guide licences in accordance with the Wildlife Act 1953 and sports fishing guide licences in accordance with this Act:*

- *(g) to sell or arrange the sale of, in New Zealand or outside New Zealand, game bird habitat stamps and associated products:*
- *(h) to recommend to the New Zealand Fish and Game Council the form of game bird habitat stamps.*

*(2) Each Fish and Game Council shall have such other functions as are conferred on it by or under this Act or any other Act.*

*(3) The following provisions shall apply in respect of operational work plans:*

- *(a) each Fish and Game Council shall prepare such a plan annually:*
- *(b) such plans shall be submitted to the Minister for the Minister's approval if there is no sports fish and game management plan for the time being in force for the area:*
- *(c) the Minister shall approve or amend plans submitted under paragraph (b):*
- *(d) subject to paragraph (e), such plans shall have effect on and from the date of their completion by a Council but shall be subject to any amendments made by the Minister:*

*(e) if there is no management plan for any species of sports fish or game for the time being in force for the region of a Council, those provisions of the Council's operational work plan that relate to the management of those species for which there is no management plan shall not have effect until approved by the Minister.*

## **26ZJ Offences relating to spawning fish**

- *(1) Every person commits an offence who—*
  - *(a) disturbs or damages the spawning ground of any freshwater fish:*
  - *(b) disturbs or injures the eggs or larvae of any freshwater fish:*
  - *(c) is in possession of the eggs or larvae of any freshwater fish:*
  - *(d) with any spear, gaff, speargun, net, trap, or similar device takes any sports fish from any river or stream where sports fish are congregating or have congregated for spawning:*
  - *(e) while in the vicinity of any river or stream where sports fish are congregating or have congregated for spawning, has possession or control of any spear, gaff, speargun, trap, or*

*similar device or material suitable for the taking of any sports fish, in circumstances likely to result in the taking of sports fish.*

*(2) Nothing in subsection (1) shall apply to—*

- *(a) the taking of freshwater fish or the eggs or larvae of such fish for the purposes of scientific investigation or data collection, under a permit or authority under this Act, and in accordance with any conditions imposed by such permit or authority:*
- *(b) the taking of freshwater fish subsequently found to contain eggs or larvae.*

## Appendix 2 - Estimates of Angler Use of Canterbury Rivers and Lakes

		Season								River Salmon Fishery	Lowland
		1994/95		2001/02		2007/08		2007/08 Days	2007/08 1_SE		
						Overseas	New Zealand resident				
Reach	River Name	Days	1_SE	Days	1_SE	Days	1_SE	Days	1_SE		
	Lake Donne		0		0	27	27	0	27		
	Larch Stream	100	73		0		0	47	47		
	Monopolies Pond		0	70	70		0	0	0		y
	Settlement Road Pond		0		0	40	40	0	40		y
	Slovens Stream		0		0	27	27	0	27		
	Stony River		0	40	40		0	0	0		
	Sutherlands Creek		0	49	49		0	0	0		
	Taylors Stream		0	13	13		0	5	5		y
	Conway River	12	11	63	40		0	146	146		y
	Kahutara River		0	30	30		0	0	0		y
	Lyell Creek		0	41	41		0	0	0		y
	Styx River	437	190	708	315		0	436	234		y
	Andersons Creek		0		0		0	16	16		y
	Ashburton River	4173	778	5477	1132	256	141	2963	660		y
	Avon River	1017	452	727	251	135	135	414	194		y
	Bowyers Stream	145	130	281	238	54	54	122	111		y
	Cam River	1577	1067	119	82		0	160	88		y
	Coopers Creek		0	27	27		0	0	0		y
	Cust River	362	190	42	31		0	758	341		y
	Eyre River	77	54		0		0	0	0		y
	Glentui River	207	115		0		0	0	0		y
	Hae Hae Te Moana River		0	12	12		0	0	0		y
	Halswell River	1760	881	221	126		0	459	182		y

Harts Creek	1008	517	484	120	27	27	603	333	630	334	y
Hawkins River	207	137	77	45		0		0		0	y
Heathcote River	30	29	260	160		0		0		0	y
Hinds River	210	99	322	173		0		0		0	y
Hororata River	160	132		0		0		0		0	y
Irishman Creek	20	19	25	25		0		0		0	y
Irwell River	433	237	35	31		0		0		0	y
Kaiapoi Lakes		0	604	360		0	12	12	12	12	y
Kaiapoi River	5247	2150	1804	463		0	3761	1186	3761	1186	y
Kakahu River	121	107	24	17		0		0		0	y
Kowai River	13	12	275	170		0		0		0	y
L II River	2132	1111	681	289	135	135	460	205	595	245	y
Lake Ellesmere	424	283	152	152	27	27	165	74	192	78	y
Lake Forsyth	308	169	325	144		0	216	216	216	216	y
Maerewhenua River	466	232	197	94	94	56	449	209	544	217	y
Motunau River	17	16		0		0	280	281	280	281	y
Ohapi Creek	119	116		0		0	189	118	189	118	y
Ohoka Stream		0	124	105		0		0		0	y
Okana River	515	309	57	39		0	922	681	922	681	y
Okuku River		0	27	27		0	178	119	178	119	y
Okuti River		0		0		0	216	216	216	216	y
Opihi River	18453	1661	13393	1660	539	249	19155	2620	19694	2632	y
Opuha River	1498	485	1306	386	418	161	420	143	837	215	y
Orari River	6332	769	2307	559	81	47	572	211	653	216	y
Pareora River	189	113	849	289	81	81	311	200	392	216	y
Pareora River (South Branch)		0		0		0	6	6	6	6	y
RDR Canal	17	17	957	767		0	112	60	112	60	y
Ryton River	71	71	47	27	27	27		0	27	27	y
Saltwater Creek		0	112	98		0	48	30	48	30	y
Selwyn River	6702	1372	2127	545	135	111	868	281	1003	303	y
Silverstream	1402	620	317	151		0	21	21	21	21	y

Te Ngawai River	86	47	890	388	27	27	123	77	150	81	y
Temuka River	1281	280	967	338		0	966	319	966	319	y
Tentburn Outfall	2277	1178	35	35		0	12	12	12	12	y
The Groynes		0	436	206		0	636	230	636	230	y
Waihao River	646	291	1101	586		0	637	302	637	302	y
Waihao River (North Branch)		0		0		0	292	150	292	150	y
Waihao River (South Branch)		0	12	12		0	305	126	305	126	y
Waihi River	1670	789	692	394	108	108	576	319	684	337	y
Waikuku Stream		0	190	190		0		0		0	y
Waimakariri South Branch	2563	687	290	100		0	559	360	559	360	y
Waimate Creek	22	21		0		0	288	289	288	289	y
Waipara River		0	83	49		0	934	824	934	824	y
Wairarapa Stream	226	143		0		0	141	96	141	96	y
Wakanui Creek		0	61	61		0		0		0	y
Clarence River	840	373	281	126		0	494	164	494	164	y
Lake Tennyson	448	330	82	46	27	27	127	62	154	67	
Deep Creek	22	21	76	76		0	13	14	13	14	
Ada River	18	18		0	27	27		0	27	27	
Ahuriri River	2592	716	2903	577	2155	408	2731	597	4886	723	
Ashley River	4533	1051	3517	685	242	181	5185	2011	5427	2019	
Avoca River		0	190	78		0	107	72	107	72	
Avon Burn	17	17		0		0	73	73	73	73	
Bell's Pond		0	223	171		0	108	69	108	69	
Boyle River	386	268	197	78	81	47	322	163	403	169	
Broken River	684	327	289	96	162	76	243	122	405	144	
Cass Hill Stream		0	46	46		0		0		0	
Cass River		0	29	21		0	104	71	104	71	
Clear Stream		0		0		0	63	50	63	50	
Coal River	20	20		0		0		0		0	

Courtenay Stream		0	8	8		0	143	104	143	104	
Deep Stream	189	117	13	13		0	155	121	155	121	
Dobson River		0	284	131	162	85	1085	320	1246	332	
Doubtful River		0	47	36	54	54	115	107	169	120	
Doubtless River		0		0		0	107	107	107	107	
Esk River		0	85	44		0		0		0	
Fork Stream	39	27		0	27	27		0	27	27	
Fraser Stream		0		0	108	108	23	23	130	110	
Glenariffe Stream		0	187	69		0		0		0	
Godley River	101	77	124	85	27	27	216	161	243	163	
Grays River	87	58	257	103	27	27	282	176	309	178	
Hakataramea River	1916	484	1614	442	216	107	1043	448	1258	461	
Hanmer River	24	23	27	27		0	29	29	29	29	
Harper River	118	116	191	65	27	27	292	114	319	117	
Henry River		0		0	27	27		0	27	27	
Hopkins River	348	225	132	87	135	60	451	209	585	218	
Hurunui River	17105	3327	1097	374	310	138	2225	719	2535	732	y
Huxley River	257	143		0	27	27	154	128	181	131	
Hydra Waters		0	7	7		0	9	9	9	9	
Jollie River		0	118	87		0		0		0	
Kelland Pond	17	17	774	421		0	548	395	548	395	
Kurow River	273	130	65	37		0	162	162	162	162	
Lake Alexandrina	4478	716	9467	1376	256	115	6095	1118	6351	1124	
Lake Aviemore	8850	1325	11576	1489	54	38	18354	2735	18408	2735	
Lake Benmore	12829	1483	21738	1680	902	337	58849	4585	59751	4597	
Lake Bryndwyr	296	290	40	40		0		0		0	
Lake Camp	680	186	473	191	81	60	404	168	484	178	
Lake Catherine	624	349	248	118	81	60	259	86	340	105	
Lake Clearwater	2899	816	1481	327	202	121	4601	1152	4803	1158	
Lake Coleridge	7094	1311	9168	850	484	241	12915	1563	13399	1581	
Lake Emily	22	21	135	51		0	249	122	249	122	

Lake Emma	435	153	370	136	27	27	688	255	715	257
Lake Evelyn		0	47	36	27	27	128	74	155	79
Lake Georgina	885	278	661	173	81	47	1939	506	2020	508
Lake Grasmere	821	282	445	111	81	47	368	144	448	151
Lake Guyon		0	162	81		0		0		0
Lake Hawdon	177	108	380	116	27	27	159	75	186	80
Lake Henrietta		0		0	27	27	322	216	349	218
Lake Heron	2617	731	2578	939	162	114	2576	513	2738	526
Lake Hood		0		0		0	313	165	313	165
Lake Ida	509	475	736	186	108	54	92	45	200	70
Lake Letitia		0	68	40		0		0		0
Lake Lilian		0	30	30		0	38	28	38	28
Lake Lyndon	3289	803	1968	357	94	68	2726	789	2820	792
Lake Mason	300	296	17	17		0	377	146	377	146
Lake McGregor	17	17	594	220		0	789	264	789	264
Lake Meremere		0	338	113	108	76	115	72	223	105
Lake Merino		0	67	67		0	16	16	16	16
Lake Middleton	875	355	42	31		0	46	34	46	34
Lake Minchin	196	193		0		0		0		0
Lake Mystery	60	59		0		0	10	10	10	10
Lake Ohau	1516	378	4631	680	175	118	9689	1830	9864	1834
Lake Opuha		0	2670	426	404	263	4752	1109	5156	1140
Lake Pearson	1746	628	2285	351	81	60	2761	534	2842	538
Lake Poaka		0	13	13	81	81	786	342	867	352
Lake Pukaki	623	187	1097	321	81	81	953	538	1034	544
Lake Rotakahautu		0	319	319		0	140	141	140	141
Lake Roundabout	52	37		0	27	27		0	27	27
Lake Ruataniwha (Wairepo)	1033	344	1700	477	27	27	4539	1480	4566	1480
Lake Sarah	563	187	268	96	27	27	67	35	94	44
Lake Selfe	604	222	977	199	175	99	1745	625	1920	633
Lake Sheppard	233	115	124	53	54	38	184	93	237	101



Lake Stream		0	399	250	27	27	38	27	64	38	
Lake Sumner	387	165	523	206	27	27	1881	515	1908	516	
Lake Taylor	748	252	968	215	54	38	3267	1277	3321	1278	
Lake Tekapo	3003	774	8728	977	202	102	7546	1063	7748	1067	
Lake Waitaki	5233	1161	3047	884		0	3567	898	3567	898	
Lake Wardell	17	17	27	27		0		0		0	
Lewis River	273	258	106	54	27	27	22	22	49	35	
Loch Cameron		0	119	89		0	90	47	90	47	
Loch Katrine	192	134	196	67		0	256	139	256	139	
Macaulay River		0	135	91		0	102	81	102	81	
Maitland Stream	17	17	93	93		0	32	32	32	32	
Mandamus River		0		0		0	27	27	27	27	
Maori Lakes	68	33	216	120	54	38		0	54	38	
Mary Burn	30	20	196	75	135	71	271	166	406	181	
Mason River		0	30	30		0		0		0	
Minchin Stream		0	30	21		0		0		0	
Nina River	261	258	40	23	27	27	177	118	204	122	
Ohau Canal	1077	632	5373	2060	135	90	5503	1579	5638	1582	
Ohau River	636	193	484	154	54	38	481	170	534	174	
Omarama Stream	493	168	389	288	189	118	70	37	259	123	
Otamatapaio River		0	52	52		0		0		0	
Otematata River	594	213	182	111	27	27	1029	517	1056	518	
Parsons Rock Creek	54	39		0		0		0		0	
Porter River	370	270	174	85	54	54	217	124	271	135	
Poulter River	30	29	76	34	54	38	325	209	379	212	
Pukaki Canal		0	433	396		0	790	298	790	298	
Rakaia River	34649	3846	21460	2042	498	212	52705	4438	53203	4443	y
Rangitata River	35963	2554	12706	1930	270	119	33229	3560	33499	3562	y
Sisters Sream		0		0	27	27		0	27	27	
Spider Lakes		0		0	27	27		0	27	27	
Tasman River		0	5	5	81	47	254	174	335	180	

	Tekapo Canal	867	236	7696	945	0	4441	1431	4441	1431	
	Tekapo River	2416	493	4910	696	1656	404	2799	432	4455	592
	Temple Stream		0		0	108	54		0	108	54
	Twizel River	723	356	1251	322	620	218	3200	609	3820	647
	Waiau River	1444	493	2133	419	135	135	4209	1007	4343	1016
	Waimakariri River	58357	7095	48948	4260	350	185	75075	6063	75425	6066
	Waitaki River	34496	3145	1580	476	108	66	5051	1446	5159	1448
	Waitohi River		0		0		0	216	195	216	195
	Whale Stream		0		0		0	10	10	10	10
	Wilberforce River		0	52	39		0	259	221	259	221
	Winding Creek		0	27	27		0		0		0
1	Clarence River		0	155	85	270	137	1121	437	1391	458
1	Hurunui River		0	2914	354	162	101	4239	796	4401	802
1	Waitaki River		0	3603	958		0	3597	921	3597	921
2	Clarence River		0	181	80		0	1128	478	1128	478
2	Hurunui River		0	4367	849		0	5663	946	5663	946
2	Waitaki River		0	4644	762		0	6166	2111	6166	2111
3	Waitaki River		0	4645	901		0	4179	937	4179	937
4	Waitaki River		0	2332	390		0	2559	1038	2559	1038
5	Waitaki River		0	10774	2065		0	6908	1803	6908	1803
<b>Grand Total</b>		<b>380691</b>	<b>11458</b>	<b>326272</b>	<b>8009</b>	<b>21987</b>	<b>1300</b>	<b>471315</b>	<b>12570</b>	<b>493302</b>	<b>12637</b>

## Appendix 3 - Relevant provisions of Sports Fish and Game Management Plans

### Nelson Marlborough Sports Fish and Game Management Plan

- b. **Goal 1: Manage, maintain and enhance the Sports Fish and Game Resource**
- c. **Goal 2: Maximise recreational angling and hunting opportunity**

*Key objectives for sports fish and game bird management are to:*

- 1.1 *Maintain sustainable populations of harvestable sports fish and game bird species*
- 1.2 *Protect and increase habitat for sports fish and game birds*
- 1.3 *Ensure a sustainable harvest of the resource by enforcing fishing and hunting regulations.*
- 1.4 *Have regard to the effects of fish & game management activities on other natural resources and resource users*

*Key objectives for maximising recreational angling and hunting opportunity are to:*

- 2.1 *Encourage maximum angler and hunter participation, access to the fishing and hunting resource and maintain the quality of the recreational experience*
- 2.2 *To gain and maintain acceptance of the recreation of sports fishing and game bird hunting in the wider community*
- 2.3 *Maximise the sale of angling and hunting licences in the region*
- 2.4 *Provide for the governance of the fish and game system by fish and game licence holders*
- 2.5 *Ensure the planned and coordinated management of the sports fish and game bird resource*
- 2.6 *Maintain liaison with those landowners/resource managers which provide sports fish and game bird habitat and/or angling and hunting opportunities.*

- d. **Formal statutory planning process**

*Fish and Game (NM) will provide for and recognise Fish and Game (NM) and the New Zealand Council's interests in all appropriate statutory planning matters. This will involve:*

1. consultation under the First Schedule of the Resource Management Act with the appropriate local authorities on all relevant planning documents.
2. submissions in relevant resource and other consent processes to advocate for decisions and conditions that promote sports fish and game bird interests and the interests of anglers and hunters
3. *solutions of remediation or mitigation, where adverse effects of activities on sports fish and game bird habitat or recreational values cannot be avoided*
4. *development of effective protocols with other resource management authorities to manage key environmental impacts.*
5. *liaison with the Department of Conservation and Nelson Marlborough Conservation Board on their planning processes as required.*

[In the Zone Section] Wairau South

*This includes the rugged South Marlborough mountain pastoral country, centred on New Zealand's largest farm, Molesworth. This provides back country angling and plenty of Canada goose hunting and habitat for chukar and Californian quail. To the east the Clarence River drains through dry gorges and the rocky Kaikoura Coast, providing the most reliable salmon fishing in the region at the mouth. Kaikoura provides limited freshwater fishing, but plenty of waterfowl hunting and the potential for more upland game. The north-western area of this sub-region is drained by the Wairau River, which provides a diversity of angling and hunting opportunities, with much of the best quail hunting opportunities available there. The Wairau or Vernon Lagoons at the river's mouth provide a tremendous wildlife resource and hunting opportunity.*

## APPENDIX

*Table of public recreational sites of interest to anglers and hunters in the Nelson Marlborough Region [those located in the Canterbury Regional Council area only]*

<b>Nelson Marlborough Bodies</b>	<b>Water</b>	<b>Water Type</b>	<b>Size</b>	<b>ROS Catego ry</b>	<b>Recreational Significance</b>	<b>Brown Trout</b>	<b>Salmon</b>	<b>Duck s</b>	<b>Ge</b>
Clarence (below confluence)	River Acheron	River	Large	Remote	Regional	Yes	Yes		Ye
Clarence (upstream of River confluence)	River	River	Large	Natural	Regional	Yes			Ye
Conway River		River	Small	Rural	Local	Yes			Ye
Kahutara River		River	Small	Rural	Local	Yes			
Kaikoura Lakes		Wetland	Small	Rural	Local			Yes	Ye
Lyell (Kaikoura)	Creek	River	Small	Urban	Local	Yes		Yes	
Middle Creek		River	Small	Rural	Local	Yes			
Molesworth Park	Farm	Farm	Large	Remote	National	Yes	Yes	Yes	Ye
Tennyson Lake		Lake	Small	Remote	Local	Yes			Ye

# North Canterbury Sports Fish and Game Bird Management Plan

## 2.3 Management objectives

*The primary goals of this Plan reflect the functions of Fish and Game as defined in the Act. They are:*

- 1. To maximise recreational opportunities for sustainable fishing and hunting**
- 2. To monitor, protect and enhance the populations and habitats of fish and game**
- 3. To develop and operate policies, standards and annual operational plans in a manner which is evidence-based and consistent with this Plan.**

### **Waiau River**

*The Waiau catchment contains a highly valued trophy brown trout fishery with the upper Waiau, Hope, Boyle and Doubtful all producing trophy fish. Most of the upper catchment is in scenic surroundings under the management of the Department of Conservation, including the recently retired St James Station. This means enhanced recreational access and probably an increase in fishing pressure.*

### **Lake Sumner**

*Lake Sumner is a popular recreational lake which also provides an important rearing and breeding habitat supplying fish to the productive Hurunui River trout fishery. Migratory chinook salmon are also present at various times of the year. Its pristine environment of montane landscape and beech forest is highly regarded by many of those who fish its waters.*

### **Hurunui River and stream catchment**

*The Hurunui sustains angling pressure for chinook salmon and brown trout. The river is considered by many to be the best trout river fishery in the region, with most recreational attention focused on the reaches above the Mandamus confluence. Drift*

*diving surveys regularly demonstrate very high trout numbers, especially immediately below the Lake Sumner outlet. The area is also unique for the quality of the recreational experience it offers. The upper Hurunui is appreciated for its scenic 'wilderness' qualities by many of those who fish its upper catchment.*

### **Ashley River**

*The Ashley River is a popular fishery due to its proximity to Christchurch and for its quality of brown trout. Fish numbers are not high but the quality and size of fish ensures this river receives a reasonable amount of pressure from anglers. The Ashley suffers from low flows in the summer but there is always suitable habitat for trout in the gorge and at the mouth. The Ashley used to support a limited salmon run which is almost non-existent now.*

### **Waimakariri River**

*From a sports fishery perspective the Waimakariri River is the most popular recreational fishery in the South Island with some 75 000 angler days spent there in the 2007/08 season. The fishing effort is sustained by the attraction of a wild and artificial run of chinook salmon, the latter being released from the Silverstream Hatchery and into the Otukaikino River. Brown and Rainbow trout populations are also subject to moderate to high fishing pressure. Overall, the proximity and the accessibility of the main stem and tributaries to residents of Christchurch, Kaiapoi, Rangiora, and Oxford, together with its sizable run of chinook salmon, accord this river a high status for management.*

### **Te Waihora (Lake Ellesmere) & tributaries**

*Te Waihora is a wetland of international significance (IUCN) and supports a host of game birds and nongame bird species. These include mallard and grey ducks, paradise shelduck, New Zealand shoveler duck and black swan. Part of the Lake Ellesmere value lies in its proximity to Christchurch, as well as the extensive opportunities for public access. The Council own a property on the margins of Lake Ellesmere, at Boggy Creek. The fact that the lake and its tributaries are so close to Christchurch means that they are readily fished by many people. The Selwyn River brown trout fishery has suffered catastrophic decline from the catch figures of the 1960's. Although the Selwyn River still attracts a reasonable amount of angling*

activity, the trout run and the fishing opportunity is a fraction of what it once was. Other Ellesmere tributaries also sustain significant populations of brown trout, perch and tench. Many of these populations spend a period of time in the lake itself, while others are only resident in the tributaries.

### **Lake Lyndon**

Lake Lyndon's proximity to State Highway 73 and its high population of rainbow trout means that it is the second most popular lake fishery in the region.

### **Lake Coleridge**

Lake Coleridge is the most popular sports fishery lake system in the North Canterbury region. The use of the lake by anglers is almost double that of the next lake in the region (based on National Angler Survey figures). From both a social and fishing perspective, the opening of the fishing season in the first weekend in November is historically centred on Lake Coleridge and its surrounds. The lake and its catchment support chinook salmon, rainbow and brown trout. The chinook population is of particular significance as it is a resident land locked population, a biological feature which is rare in New Zealand chinook populations.

### **Rakaia River**

The Rakaia River supports one of the most significant chinook salmon populations in New Zealand. The annual run of chinook salmon up the Rakaia is keenly fished by up to 53,000 angler visits a year, many of them coming from outside of the North Canterbury region (based on 2007/08 National Angler Survey figures).

From a biological perspective the Rakaia chinook salmon fishery is receiving global attention. The fishing effort is sustained by the attraction of a wild and artificial run of chinook salmon, the latter being released from the Montrose Hatchery.

Catches of sea run brown trout regularly occur at the mouth of the Rakaia, although catches are variable. Resident rainbows and browns occur in moderate to low numbers along the entire river. The headwaters of the Rakaia contain wilderness fishery opportunities and important spawning habitats. The fishing effort is sustained by the attraction of a wild and artificial run of chinook salmon, the latter being released from the Montrose Hatchery.



## **Central South Island SFGBMP**

*Mission Statement: To manage, maintain, and enhance sportsfish and game resources on a sustainable basis in the recreational interest of anglers and hunters.*

**GOAL: To protect, maintain, and enhance sportsfish and game habitat to ensure species sustainability in the wild for the enjoyment and benefit of anglers and hunters.**

### **5.1 OBJECTIVE 2 - To monitor and maintain an inventory of significant habitat**

**of sportsfish and game, including current condition, threats, and trends.**

*Explanation:*

*In order to protect, maintain, and enhance habitat it is necessary for Council to firstly identify significant habitat and secondly to prioritise allocation of staff and financial resources to ensure its maintenance and enhancement into the future.*

#### **5.1.1 Policies**

*The Council will identify and maintain an inventory of significant sportsfish and game habitat throughout the region.*

### **5.2 OBJECTIVE 3 - To provide for the protection of sportsfish and game habitat through**

**a) the purchase or leasing of existing or potentially valued habitat lands,  
or**

**b) securing management authority of such lands to the Council or**

**c) providing funding assistance to construct and maintain protective works which protect valued habitat.**

#### 5.2.1 Policies

- The Council will respond to opportunities to secure title and, or management of valued fish and game habitats. Criteria to be followed for assessing the action of the Council will be:
  - the fish and game significance/potential of the land area and associated waters
  - resources available to the Council for the purchase and/or management of such land; and/or protection works
  - potential impacts or enhancement to habitat favoured by native fish and bird species
  - the scale of benefits that will be provided
  - options for increased protection such as covenants
  - access by right or afforded to anglers and hunters
  - any strategic matters that should be considered.
- The Council will where appropriate, undertake instream channel works to enhance salmonid spawning habitat in order to improve the self sustainability of an established fishery,

**5.3 OBJECTIVE 4 - To promote through statutory processes and mechanisms, the protection, maintenance, and enhancement of sportsfish and game habitat.**

*Explanation:*

*Public submission process is an integral part to all national, regional, and district plans. During the development of such strategies, statements and*

*plans there is opportunity for the Council to submit and advocate policies and methods designed to protect and enhance sportsfish and game habitat into the future.*

*Central to environmental protection is the Resource Management Act, the purpose of which is to promote sustainable management of natural and physical resources while at the same time ‘avoiding, remedying, or mitigating’ any adverse effects of activities on the environment.*

*As a matter of national importance, those administering the Act are required to recognise and provide for, among other things,*

- the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna*
- the preservation of the natural character of the coastal environment, wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development.*

*Section 7 requires those Authorities to have particular regard to, among other things, the intrinsic value of ecosystems together with the protection of the habitat of trout and salmon.*

*Fish and Game has a responsibility to exercise a watchdog function to ensure that regional councils and local district councils fulfil their statutory duties and adhere to the purpose and principles of the RMA. Much can and will be achieved to protect valued habitats through the application of regional and district policy and plans developed under that legislation.*

*As the authority responsible for administering much of the Crown Estate including significant natural habitats attendant to those areas and of particular interest to Fish and Game, it is important that the Council works closely with the Department of Conservation. Consultation and co-ordination of submissions relating to regional and district plans, consent applications, esplanade and marginal strip requirements and public recreational access is necessary to secure species habitat and public amenity values into the future.*

*Other statutory processes including tenure review of Crown leasehold and disposal of Crown lands also provides avenues for Council to advocate for reserving to the Crown those areas identified as having significant sportfish and game habitat values.*

#### **5.3.1 Policies**

- *The Council will, within regional council, Department of Conservation and district council statutory plans, promote strategies and policies which maintain, protect, and enhance fish and game habitat; including:*

*- the establishment of water management regimes that maintain or enhance*

*fish and game values, and which encourage the efficient use of water;*

*- the establishment of esplanade reserves or strips along the margins of waterways, lakes and wetlands where land is subject to sub-division.*

*- the establishment of riparian management and other practices to mitigate adverse effects resulting from agricultural, industrial, and municipal land and water uses.*

- *The Council will make submissions on resource consent applications to encourage decisions and conditions which promote the maintenance, protection and enhancement of fish and game habitats.*
- *The Council will promote the establishment of QEII Trust Covenants for the purpose of protecting fish and game habitats.*
- *The Council will advocate through administrative and legal processes for the maintenance, enhancement, and restoration of sportfish and gamebird habitat on private and publicly owned lands, including protection of riparian margins and waterways, from the adverse effects of stock.*
- *The Council, during due process relating to Crown lands disposal, will review the proposal to identify sportfish and game habitat and advocate reservation to the Crown those areas of significant value.*
- *The Council will identify those rivers or sections of rivers which are uniquely qualified for Water Conservation Order status under Part IX of RMA, and to advance applications as appropriate to achieve such status.*

**5.4 OBJECTIVE 5 - To promote through non statutory process, the protection, maintenance, and enhancement of sportsfish and game habitat**

Explanation

Wetland and riparian ecosystems are particularly important sportsfish and game habitats. Council has a role to advocate and promote to landowners and the public at large the significance habitat to securing enhanced self sustainability of its sports fish and game resources. In conjunction with local takata whenua, the Department of Conservation, and local Landcare Groups much can be achieved through education and consultation with local landholders to adopt practises to minimise adverse effects to wetlands, streams, drains, and riparian margins.

Similarly off-road vehicle and jet boat activity within the waters of the regions braided rivers, particularly during the period April to August can disturb salmonid spawning. Fish and Game has a responsibility to advise its licence holders and the public against such environmentally damaging practices.

**5.4.1 Policies**

- *The Council will co-ordinate with the regional councils, local district councils, the Department of Conservation, local takata whenua, angling and hunting clubs, non Government agencies and landholders to promote the protection and enhancement of sports fish and game habitat.*
- *The Council will promote community awareness, including promotion through Landcare groups, and recreational river user groups of the importance of water bodies, wetlands, riparian areas and their associated ecological, recreational, intrinsic and habitat values.*

**GOAL: To manage sportsfish and gamebird species to ensure that populations are maintained for sustainable recreational harvest**

**6.1 OBJECTIVE 6 - To monitor and maintain an inventory of the status, harvest, and trends of sportsfish and gamebird populations in the Central South Island Region.**

*Explanation:*

*In order for Council to fulfil its statutory obligation to manage, maintain, and enhance the sportsfish and gamebird resources in the recreational interests of anglers and hunters, it is prerequisite for Council to record and document the current status and trends of the species concerned.*

*Such an inventory enables sound decision making by Council and allows it to maximise recreational opportunity within the boundaries of sustainable harvest.*

**6.1.1 Policies**

- *The Council will compile and maintain a library of records and information from external and internal sources relating to fish and game species available within its region.*
  
- *The Council will establish and maintain an inventory detailing the location, status, recreational harvest, and population trends of fish and game species in its region.*

APPENDIX 4 – Table 1a

Management Unit	Subunit	Freshwater Objective	Critical Values	QMCi [minimum score]	Dissolved oxygen [minimum saturation] (%)	Temperature [max] (°C) to apply from October to	Temperature [max] (°C) to apply during May to	Emergent Macrophytes	Total Macrophytes	Chlorophyll a [max. biomass] (mg/m²)	Filamentous algae >20mm [max. cover of bed](%)	Benthic Cyanobacteria [max. cover of bed] (%)	Fine Sediment <2mm diameter [max. cover of bed](%)	Suitability for Contact Recreation [SFRG*]	pH	Nitrate & Other toxicants (Protection level)	DIN	DRP	Clarity black disk (m)
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Natural State				Rivers are maintained in a natural state															
Alpine Upland*	–	<u>1,2,3,4,6,7</u>	<u>High biodiversity Salmonid Fishery</u>	5-6 6	90	<u>20</u> <u>19</u>	<u>11</u>	No Set Value	No Set Value	50	10	<u>20</u>	10	Good	Maintain between 6 and 8.5 [no greater than 0.5 change]	<u>99%</u>	<u>0.08</u>	<u>0.005</u>	<u>1.6</u>
Alpine Lower*	–	<u>1,2,3,4,6,7,8</u>	<u>Salmonid Fishery Amenity</u>							120	20	<u>20</u>		Good to Fair		<u>99%</u>	<u>0.18</u>	<u>0.007</u>	<u>1.6</u>
Hill-fed Upland*		<u>1,2,3,4,6,7</u>	<u>High Biodiversity Salmonid Fishery</u>							50	10	<u>20</u>	15	Good		<u>99%</u>	<u>0.21</u>	<u>0.006</u>	<u>4</u>
Hill-fed Lower*		<u>1,2,3,4,6,7,8</u>	<u>Salmonid Fishery Amenity Contact recreation</u>							<u>200</u> <u>120</u>	30	<u>20</u>		Good to Fair		<u>95%</u>	<u>0.47</u>	<u>0.006</u>	<u>4</u>
	Urban	<u>1,2,3,5,6,7,8</u>	<u>Amenity</u>	3-5 4		20	<u>20</u>			<u>200</u> <u>120</u>	30	<u>20</u>	20	No Value Set		<u>95%</u>	<u>0.47</u>	<u>0.006</u>	<u>4</u>

Lake – fed*		<u>1,2,3,4,6,7</u>	Salmonid Fishery High Biodiversity	6		20	<u>20</u>			<del>200</del> <u>120</u>	30	<u>20</u>	10	Good		<u>99%</u>	<u>0.21</u>	<u>0.003</u>	<u>3</u>
Banks Peninsula*		<u>1,2,3,4,6,7,8</u>	High Biodiversity	<del>4</del> 5 <u>5</u>		20	<u>20</u>			120	20	<u>20</u>	20	No Value Set		<u>99%</u>	<u>0.09</u>	<u>0.025</u>	<u>2</u>
Spring-fed Upland*		<u>1,2,3,4,6,7</u>	High Biodiversity Salmonid Spawning	6		<del>20</del> <u>19</u>	<u>11</u>	20	30	50	10	<u>20</u>	10	Good		<u>99%</u>	<u>0.10</u>	<u>0.007</u>	<u>3</u>
Spring-fed lower basins*		<u>1,2,3,4,6,7</u>	High to moderate Biodiversity Salmonid Fishery	5		20	<u>11</u>	30	30	<del>200</del> <u>120</u>	30	<u>20</u>		Fair		<u>95%</u>	<u>0.47</u>	<u>0.010</u>	<u>3</u>
Spring-fed – plains*		<u>1,2,3,4,6,7,8</u>	Moderate Biodiversity Salmonid Fishery	<del>4.5</del> <del>5</del> <u>5</u>	<del>70</del> <u>80</u>	20	<u>11</u>	30	50	<del>200</del> <u>120</u>	30	<u>20</u>	20	No Value Set		<u>95%</u>	<u>1.5</u>	<u>0.016</u>	<u>3</u>
	Urban	<u>1,2,3,5,6,7,8</u>	Moderate Biodiversity Amenity	<del>3.5</del> <u>4</u>		20	<u>11</u>	30	<del>60</del> <u>50</u>	120	30	<u>20</u>	<del>30</del> <u>20</u>	No Value Set		<u>95%</u>	<u>1.5</u>	<u>0.016</u>	<u>2</u>



CANTERBURY WATER BODY VALUES - SCHEDULE XX (Salmonid Fishery, White Water Recreation, Jet Boating, Game Birds)	Water Conservation Order	Outstanding Salmonid Fishery	Regional Salmonid Fishery	Local Salmonid Fishery	High Naturalness	Primary Salmonid Spawning	Secondary Salmonid Spawning	Regional Iconic Backcountry	White Water Recreation	Jet Boat Recreation	Game Bird Habitat
VALUES √											
<b><u>Central South Island</u></b>											
<b>Waterbody</b>											
<b>Ahuriri River Catchment</b>											
Ahuriri River	√		√		√	√		√	√		√
<b>Lake Benmore Catchment</b>											
Lake Benmore		√								√	√
Hydro Canals		√									
Tekapo River			√			√			√		√
Mary Burn				√	√		√				√
Greys River				√			√				√
<b>Rangitata River Catchment</b>											
Rangitata River, Upper including Gorge	√	√			√	√			√	√	
Rangitata River, Lower	√	√			√	√			√	√	√
Havelock River	√				√						
Clyde River	√				√	√					
Deep Stream (Mesopotamia)	√			√	√	√					
Deep Creek (Mt Potts)	√			√	√	√					
Black Mountain Stream	√				√	√					
McKinnons Stream	√						√				
Ealing Springs	√						√				
<b>Wainono Catchment incl Hook</b>					√						√

<b>Ashburton Catchment, Lakes &amp; River</b>											
Ashburton River		√					√			√	√
South Ashburton River				√			√				√
North Ashburton River				√							√
Bowyers Stream				√			√				
Taylor's Stream							√				
Maori Lakes Outlet					√	√					
Lake Clearwater			√		√			√			√
Whisky Creek						√					
Lake Emily			√		√						√
Lake Heron			√		√						√
Mellish Stream						√					
Lake Denny											√
<b>Hinds River Catchment &amp; Drains</b>				√			√				√
<b>Orari Catchment</b>											
Orari River		√			√	√			√		√
Ohapi Stream						√					
<b>Opihi River Catchment</b>		√	√	√		√	√				
Opihi River		√					√		√		√
Lake Opuha			√							√	√
Opuha River				√			√				√
Temuka River				√			√				√
Tengawai River				√			√				√
<b>Pareora River Catchment</b>											
Pareora River				√			√				√
<b>Otaio River Catchment</b>											
Otaio River							√				
<b>Makikihi River Catchment</b>											
Makikihi River							√				
<b>Waihao River Catchment</b>											
Waihao River & Wainono Lagoon				√	√		√			√	√
<b>Upper Waitaki, Lakes and Rivers</b>											
Lake Tekapo		√								√	
Lake Alexandrina		√			√	√		√			√
Macauley River					√					√	
Godley River					√					√	

Lake Ohau		√									√
Hopkins River				√	√			√		√	
Dobson River				√	√			√		√	
Larch Stream					√	√					
Lake Pukaki											
Hooker River					√				√		
Pukaki River									√		
Lake Ruataniwha			√							√	
Lake Aviemore		√								√	
Deep Stream				√	√		√				
Otematata River				√	√		√				
Lake Waitaki			√								√
<b>Lower Waitaki River</b>		√				√				√	√
Hakataramea River			√			√					√
Awakino Stream							√				
<b><u>Nelson Marlborough</u></b>											
<b>Waterbody</b>											
Clarence River and tributaries			√	√	√	√	√	√	√	√	√
Hapuku River										√	
Middle Creek, Kaikoura				√		√	√				
Lyell Creek, Kaikoura				√		√	√				
Kaikoura Lakes											√
Kahutara River				√			√				
Oaro River				√			√				
Conway River				√		√	√	√		√	
<b><u>North Canterbury</u></b>											
<b>Waiau River Catchment</b>											
Ada River				√	√		√				
Boyle River			√	√	√		√	√	√	√	
Doubtful River				√	√		√	√			
Lake Guyon				√	√		√	√			
Henry River				√	√		√				
Hope River			√		√	√	√	√	√	√	
Leader River				√			√				
Lewis River				√	√		√				
Mason River									√		
Nina River				√	√		√	√			
Waiau River Upper				√	√	√		√	√	√	

Waiau River (Below Hope River)			√						√	√	
Waiau Lagoon											√
<b>Hurunui River Catchment</b>											
Hurunui River Above Mandamus		√	√		√	√		√	√	√	
Hurunui River Below Mandamus		√	√				√		√	√	
Hurunui Lagoon											√
Loch Katrine				√	√		√	√			
Mandamus River				√			√				
Lake Mason				√	√		√	√			
Pahau River				√			√				
Lake Sheppard			√	√	√		√	√			√
Lake Sumner			√		√		√	√			
Lake Taylor			√		√		√	√			√
Waikari River				√			√				
Waitohi River				√			√				
Motunau River										√	
Waipara River				√			√			√	
Kowhai River										√	
<b>Ashley River Catchment</b>											
Ashley River			√	√			√	√	√	√	
Ashley Lagoon											√
Okuku River				√			√		√		
Saltwater Creek				√			√				
<b>Waimakariri River Catchment</b>											
Broken River				√	√		√	√		√	
Cam River				√			√				
Cass Hill Stream (Bullet Creek)				√	√	√					
Craigieburn Stream				√	√		√				
Groynes Fishing Lakes		√	√								√
Cora Lynn Stream					√	√					
Lake Courtenay				√							
Cust River				√			√				
Esk River					√		√	√		√	
Grasmere Stream							√				
Lake Grasmere				√			√	√			√
Lake Hawdon				√	√		√	√			
Kaiapoi Lakes				√			√				
Kaiapoi River			√				√				
Kowai River										√	
Letitia, Lake				√	√						
Lake Marymere				√	√		√	√			

Lake Minchin				√	√		√	√			
Otukaikino Creek			√				√		√		
Lake Pearson			√		√		√				√
Porter River				√	√		√	√			
Poulter River				√	√	√		√		√	
Lake Rubicon				√	√		√				
Lake Rotokohatu				√			√		√		
Lake Sarah				√	√		√	√			
Slovens Creek							√				
Styx River				√			√		√		√
Styx Mill Wetland											√
Waimakariri River Upper		√	√		√	√		√	√	√	
Waimakariri River (Below Gorge)		√	√				√		√	√	
Brooklands Lagoon											√
Winding Creek				√	√	√		√			
<b>Avon River Catchment</b>											
Avon River			√				√		√		
Avon-Heathcote Estuary											√
Heathcote River				√			√		√		
Heathcote Estuary											√
Travis Wetland											√
<b>Bank's Peninsula Catchments</b>											
Lake Forsythe				√							√
Kaituna River				√			√				
Okana River				√			√				
Okuti River				√			√				
Takiritawai River				√							
<b>Selwyn River Catchment</b>											
Te Waihora/Lake Ellesmere	√			√							√
Halswell River				√			√				
Harts Creek				√			√				
Hawkins River				√			√				
Hororata River				√			√				
Irwell River				√			√				
LII (L2) River				√			√				
Selwyn River			√			√					
Cooper Lagoon											√
Lee Stream				√			√				
Tentburn Stream				√			√				

Rakaia River Catchment											
Avoca River	√			√	√	√		√			
Lake Coleridge	√	√	√					√			
Double Hill Flat Stream	√				√	√					
Lake Evelyn	√			√	√			√			
Lake Georgina	√		√		√		√	√			
Glenariffe Stream	√			√		√		√			
Goat Hill Stream Upper					√		√				
Goat Hill Stream Lower	√			√	√	√					
Harper River and tributaries	√			√		√		√			
Hennah Stream	√			√	√	√	√	√			
Lake Henrietta	√			√	√		√				
Hydra Waters	√			√	√	√		√			
Lake Ida and Little Ida	√			√	√		√	√			
Lake, Stream	√			√	√		√			√	
Lake Lilian	√			√	√		√				
Lake Lyndon			√		√		√				
Manuka Point Stream	√			√	√	√					
Lake Monck (Catherine)	√			√	√		√	√			
Rakaia River Upper	√	√	√		√	√		√	√	√	
Rakaia River Lower	√	√	√				√			√	
Rakaia Lagoon											√
Ryton River	√			√	√		√	√			
Lake Selfe	√				√		√	√			
Wilberforce River	√			√	√		√	√		√	
	<p>Schedule XX provides an inventory of salmonid fishery and recreational water body values which have significance for anglers, sports game hunters, small craft white water recreation activities (such as kayaking and rafting) and jet boating. This Schedule does not intend to represent all water bodies in Canterbury or all associated water based activities and their values, nor does it represent indigenous fish species. The Schedule provides guidance for the management and protection of these water bodies by identifying their respective values in the categories shown above; which inturn relate to "Purposes of Management" (Hayward et al., 2009) as detailed in Table 1 as Freshwater Objectives and associated management units and limits. Freshwater Objectives particularly relevant to this Schedule are: 2,3,4,5,8. The values identified in this schedule are provided to support the maintenance, restoration or enhancement of these specific water bodies. Targets for these water bodies can be higher than the related management unit bottom line limits, prescribed generically in the Hayward et al. Water Quality Report, March 2009.</p>										
Schedule XX Purpose											
Value Definitions											
Water Conservation Order	Under the Resource Management Act 1991, the term <i>water conservation order</i> means an order made under section 214 for any of the purposes set out in section 199 and that imposes restrictions or prohibitions on the exercise of regional councils' powers under paragraphs (e) and (f) of section 30(1) (as they relate to water) including, in particular,										
	restrictions or prohibitions relating to—										
	(a) the quantity, quality, rate of flow, or level of the water body; and										
	(b) the maximum and minimum levels or flow or range of levels or flows, or the rate of change of levels or flows to be sought or permitted for the water body; and										
	(c) the maximum allocation for abstraction or maximum contaminant loading consistent with the purposes of the order; and										
	(d) the ranges of temperature and pressure in a water body.										

Outstanding Salmonid Fishery	This value relates to salmonid fisheries having 5000 or more angler days per year, as defined by the Annual National Angler Survey. The use of this water body for recreational fishing also reflects a nationally significant level of amenity received from this recreational resource in terms of the overall angler experience. This water body provides significant habitat attributes which need to be safeguarded in order to protect amenity levels. The habitat associated with this value provides important advantages for the healthy functioning of aquatic ecosystems.										
Regional Salmonid Fishery	This value relates to salmonid fisheries having more than 1000 angler days per year, as defined by the Annual National Angler Survey. The use of this water body for recreational fishing also reflects a regionally significant level of amenity received from this recreational resource in terms of the overall angler experience. The habitat associated with this value provides important advantages for the healthy functioning of aquatic ecosystems.										
Local Salmonid Fishery	This value relates to salmonid fisheries having up to 1000 angler days per year, as defined by the Annual National Angler Survey. The use of this water body for recreational fishing also reflects a locally significant level of amenity received from this recreational resource in terms of the overall angler experience. The habitat associated with this value provides important advantages for the healthy functioning of aquatic ecosystems.										
High Naturalness	This value relates to water bodies that are still in a predominantly unmodified natural state, having minimal human interference in terms of water quality and natural flow regimes. These water bodies exhibit pristine conditions relative to other human influenced or modified rivers in Canterbury and afford high levels of amenity and habitat quality.										
Primary Salmonid Spawning	This value relates to water bodies containing intensive spawning grounds for salmonids. These are the most productive spawning areas and are critical for the maintenance and enhancement of salmonid populations. The level of significance and habitat features of these spawning areas warrants the highest level of protection achievable.										
Secondary Salmonid Spawning	This value relates to water bodies containing more extensive spawning grounds for salmonids, with a secondary ranking compared to primary spawning water bodies. These water bodies are also critical for the maintenance and enhancement of salmonid populations. The level of significance and habitat features of these spawning areas warrants a high level of protection.										
Regional Iconic Backcountry	This value relates to water bodies that provide special backcountry experiences for anglers tied very much to the quality of the overall experience and amenity afforded to anglers. They have iconic status at a regional and sometimes national level and are typically associated with high country locations and the head waters of Canterbury rivers. These locations are not graded on angler use but on the values anglers associate with having access to these more remote wilderness locations. Protecting the special characteristics of these water bodies plays an important role in protecting the overall amenity and downstream quality of many Canterbury salmonid fisheries.										
White Water Recreation	This value identifies Canterbury rivers or reaches of rivers that have established white water values and which are the most valued and used by members of the paddling community including kayakers, canoeists, river buggers, rafters and catarafters. Some of the rivers are nationally significant and protected by Water Conservation Orders recognising such values, some are nationally significant but not yet protected by Water Conservation Orders, and the remainder are regionally significant. The rivers provide white water with a range of grades suitable for beginners through to experts.										

Jet Boat Recreation	This value identifies Canterbury rivers or reaches of rivers that have speed uplifts on them permitting jet boating and that have jet boating values. Some of the rivers are nationally significant and protected by Water Conservation Orders recognising such values, some are nationally significant but not yet protected by Water Conservation Orders, and the remainder are regionally significant. The rivers provide jet boating with a range of grades suitable for beginners through to experts.										
Game Bird Habitat	The game bird habitats shown in this Schedule have national and regional levels of significance and provide for the life supporting requirements of these birds at the relevant stages in their lifecycle.										