BEFORE THE CANTERBURY REGIONAL COUNCIL

***IN THE MATTER OF*:** the Resource Management Act 1991

AND

***IN THE MATTER OF*:** a submission on the Proposed Canterbury Land and Water Regional Plan

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EVIDENCE OF PHILIPPE JEAN ROBERT GERBEAUX FOR DIRECTOR-GENERAL OF CONSERVATION

Dated 4 February 2013

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INTRODUCTION

1. My full name is Philippe Jean Robert Gerbeaux.

2. I have the following qualifications: D.E.A. ("Diplôme d'Etudes Approfondies", eq. M.Sc.) in Ecology, Ethology and Planning (1982) from the University of Toulouse (France), D.E.P.T.N. ("Diplôme d'Expert en Prévention et Traitement des Nuisances") a post graduate diploma in Prevention and Treatment of Pollution (1982) from the University of Savoie and Ph.D in Resource Management and Ecology (1989) from the University of Canterbury and Lincoln College (New Zealand).

3. I have worked in the field of wetland ecology and management for the last 28 years, in New Zealand and overseas, working both in a research and management capacity.

4. I am currently employed as a Senior Technical Advisor by the Department of Conservation specialising in freshwater/wetland ecology and management and have been in this position since April 2009. I provide specialist advice on the management, restoration and use of freshwater and wetland ecosystems and species at national level.

5. Between 1995 and 2006, I was employed by the Department as a Technical Support Officer on the West Coast and regularly provided advice on relevant matters of wetland identification, delineation and assessment. In that position I also co-ordinated conservation, survey and monitoring programmes related to indigenous freshwater fish and fisheries. I was seconded during the last part of that period to the Research and Development Division of the Department to lead the wetland component of the Waters of National Importance ("WONI") project.

6. I have also been appointed by the Oceania Government members of the Ramsar Convention (an International Convention on Wetlands), as their Regional Networker on the Scientific and Technical Review Panel (the "STRP") of the Convention, since 2005. I am currently completing my second term

with the STRP and in this capacity have liaised with and support all Ramsar National Focal Points from the Oceania region. I also participated annually in the STRP meetings held with other wetland experts from around the world. The meetings aim to provide advice to the Secretary-General of the Convention and help progress and improve the implementation of the Triennium programme adopted at the Ramsar Conferences of Parties which is held every three years (the last one was held in July 2012 in Romania).

7. Since completing my Ph.D I have worked as a scientist with the Department of Scientific and Industrial Research on the ecology of benthic algae in river ecosystems (1990-1992) and as a scientist and planner for "Station Biologique de la Tour du Valat" (1992-1994), a Research Institute dedicated to the Conservation of Mediterranean wetlands. Between 2006 and 2009 I held the position of Chief Technical Advisor for the newly established Regional Office for Oceania of the International Union for the Conservation of Nature (the "IUCN"), based in Suva (Fiji).

8. I have written over 30 reports and publications including 11 refereed scientific articles, with in particular a chapter on wetlands (as co-author) in the 2004 *Freshwaters of New Zealand* and a book (also as co-author) on *Wetland types in New Zealand* also published in 2004. I am also a co-author of *Wetland ecosystems of national importance for biodiversity: criteria, methods and candidate list of nationally important wetlands* published in 2008 (by Anne Gaelle Ausseil, Philippe Gerbeaux, W.Lindsay Chadderton, Theo Stephens, Derek Brown and John Leathwick). This work was published in a special issue of the renowned *Freshwater Biology* journal in January 2011. This Special Issue is the first major compilation of studies on systematic conservation planning in fresh waters (Turak & Linke, 2011). I have refereed articles on wetlands for several scientific journals. I have also recently accepted to act as a Section Editor in the Encyclopaedia of Wetlands**,** to be published by Springer (for Volume 3: 'Wetland Methodology') for entries on 'Wetland classification'.

9. I am a member and a past committee member of the New Zealand Freshwater Sciences Society. I was invited to give a plenary address at the 2004 conference of the Society held in conjunction with the New Zealand Ecological Society in Nelson. I have been a Trustee of the National Wetland Trust of New Zealand for several years.

10. I became familiar with ecological issues associated with wetlands in New Zealand and in the Canterbury region during my Ph.D research on Te Waihora in the late 1980s and have since maintained a continuous interest in wetlands of the Canterbury region through interactions with various stakeholders including from ECan, Christchurch City Council, Universities and of course the Department of Conservation. Over my time in New Zealand, I have visited many wetlands, both on public conservation land administered by the Department of Conservation and on private land. My work involved mainly compiling inventories (wetlands and wetland species), site value assessments, vegetation mapping, providing wetland management advice to Department rangers and to Resource Management planners, and inputting into FORST-funded wetland research in collaboration with Crown Research Agencies like NIWA and Landcare Research. I was able to discuss this work during my time with the Te Tai Poutini Conservancy, directly or through hearings, to mostly stakeholders of the West Coast region including Councils, Mining companies, Federated Farmers, farmers themselves, Westland Milk Products, Landcare Trust, QEII 2 Trust, as well as community groups (through World Wetland Day activities). I had similar interactions with various stakeholders of other regions (including Northland, Bay of Plenty, Auckland, Canterbury, Tasman, Southland), but also with the national and international research communities, through my attendance at various conferences and wetland fora. I have recently provided expert evidence on behalf of Te Runanga O Ngai Tahu and the Department of Conservation in relation to an application to amend the National Water Conservation (Lake Ellesmere)

Order 1990, contributing to securing the inclusion of indigenous wetland vegetation as an outstanding feature warranting protection under the Order.

11. I have read the Code of Conduct for Expert Witnesses and agree to comply with it. I have complied with the Code in the preparation of this evidence. I have not omitted to consider material facts known to me that might alter, or detract, from the opinions expressed.

SCOPE OF EVIDENCE

12. My evidence covers:

- A brief overview of wetlands in New Zealand and in Canterbury
- Wetland classification in New Zealand and its relevance to the pCLWRP
- The functions and values of New Zealand's wetlands and their relevance to the pCLWRP
- The international recognition of the importance of wetlands and the place of International Treaties/Conventions in a New Zealand context
- The extent of loss of NZ Wetlands and the importance and significance of the wetlands remaining in Canterbury especially in the low lands
- The role that anthropogenic pressures continue to play in the region on these systems including:
    - A high rate of loss in the recent past
    - declining water quality and indirect effects
    - variations in pressures on wetlands between the lowlands and the high country
- The place of wetlands in the context of national priorities, more especially the National Policy Statement for Freshwater Management, the statement of national priorities for protecting rare and threatened biodiversity on private land, the National Biodiversity strategy and the proposed NPS on biodiversity

- a review of the wetland provisions within the pRLWP as they relate in particular to:
    - definitions
    - policies and rules
    - wetlands outside lakes and rivers
    - tools for identifying wetlands that need restoration/enhancement
    - biodiversity offsets.

A BRIEF OVERVIEW OF WETLANDS IN NEW ZEALAND AND IN CANTERBURY

13. Wetlands are precisely that: wet lands. They are places of poor drainage or where water accumulates; sites where seepage or flooding is frequent; interfaces where land meets streams, rivers, lakes, and estuaries. Wetlands grade to aquatic habitats of deep water. Freshwater wetlands grade to brackish or saline wetlands of coastal estuaries and the sea itself.

14. All forms of life need water, but wetland plants and animals are adapted to cope with an oversupply of wetness, and its consequences, such as nutrient shortages and the need to ensure a supply of oxygen to underwater parts.

15. Each wetland organism lives in those particular places that match its own requirements, tolerances, and competitive ability. Some plant species are restricted to wetlands (obligate wetland plants), while others range also to dryland habitats (facultative wetland plants). Wetlands are diverse for many reasons, and New Zealand has many different sorts.

16. Functionally, New Zealand wetlands are similar to wetlands elsewhere in the world, particularly in response to hydrological and nutrient gradients. Compositionally, however, New Zealand wetlands are unique.

17. Eighty-two per cent of our indigenous flora, including many of our iconic wetland species, is endemic, i.e. found nowhere else in the world. Best known examples relevant to the Canterbury region include kahikatea

(*Dacrycarpus dacrydioides*), cabbage tree (*Cordyline australis*), red tussock (*Chionochloa rubra*), purei (*Carex secta*), and flax (*Phormium tenax*). Some of these species often dominate large areas to form distinctive and unique wetland ecosystem types.

18. Wetlands contain a disproportionate number of New Zealand's threatened plants and animal species. They cover less than 1% of New Zealand's land area yet contain 23% of indigenous vascular plants classified as threatened or uncommon (de Lange 2010), 12% of all threatened invertebrates, 16% of nationally critical bird species, and 29% of all threatened freshwater fish (from Hitchmough et al. 2007).

19. The situation in Canterbury is comparable to the national trend (see table 1 below):

Table 1: Status of wetland threatened plant species in Canterbury (adapted from de Lange 2010 and Head's Evidence in Chief)

Threat category	**Number of wetland species/total of threatened species in Canterbury**
Extinct	2/5 (40%)
Nationally critical	9/42 (21%)
Nationally endangered	6/23 (26%)
Nationally vulnerable	7/19 (37%)
Declining	12/50 (24%)
Naturally uncommon	28/121 (23%)

It should be noted that many of these threatened plants are found along lake margins and ephemeral habitats.

WETLAND CLASSIFICATION IN NZ AND RELEVANCE TO pCRLWP

20. The purpose of outlining the New Zealand wetland classification system is there may be some unintended consequences in the pCLWRP of the

exclusion of a large number of particular wetland types from the protection mechanism proposed in the pCLWRP, especially those associated with lakes and rivers.

21. The wetland classification that is now widely accepted and used in New Zealand is that of Johnson and Gerbeaux (2004). Its overall structure emphasises functional aspects of wetlands, starting with the broad hydrological and landform setting, moving down to wetland classes based on substrate, water regime and chemistry, and finally to the lowermost level where vegetation becomes a defining factor. The structure should be regarded as semi-hierarchical, insofar as combinations of parameters are used for the groupings, both within and between levels and that units are not always clearly distinct from each other (Johnson and Gerbeaux 2004).

22. Thus, at the top level, the five most important hydrosystems relevant to the pCLWRP are plutonic (Karst), estuarine, riverine, lacustrine and palustrine. The practical application of hydrosystems is most relevant for grouping and mapping wetlands over relatively large areas and on a regional basis (Johnson and Gerbeaux 2004), but there is considerable overlap between units, as shown conceptually in Figure 1.

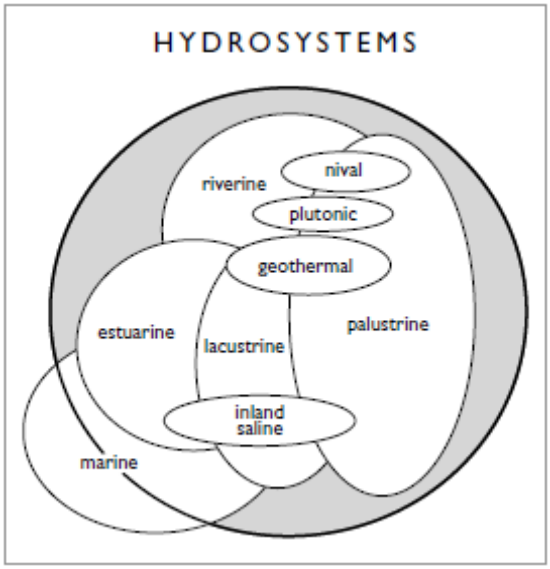

Figure 1: A conceptual arrangement of hydrosystems in relation to 'wetland' as represented by the shaded circle.

23. The riverine hydrosystem groups all wetlands associated with continually or intermittently flowing freshwater in open channels. It includes open flowing waters and both the beds and margins (riparian zones) of channels.

24. The lacustrine hydrosystem groups all wetlands associated with the waters, beds and immediate margins of lakes and other bodies of open, predominantly freshwater which are large enough to be influenced by characteristic lake features and processes such as fluctuating water level, wave action, and usually permanent and often deep water (Johnson and Gerbeaux 2004). Lakes can be arbitrarily defined as having a major dimension of 0.5km or more (Irwin 1975).

25. The palustrine hydrosystem (derived from the Latin *palus* = marsh) covers most of the other wetlands not directly associated with estuaries, lakes or rivers.

26. The estuarine hydrosystem embraces estuaries themselves, tidal reaches and mouths of rivers and coastal lagoons in particular. Due to the inclusion of häpua1 in the plan (which includes coastal lakes and shallow lakes/lagoons at the termination of a river), it is important to recognise such areas adjacent to estuarine systems as 'wetlands' too.

27. Based on the explanations above, all areas defined by the definition of "wetland" proposed by the pCLWRP (in section 2.10, p15 of the pCLWRP) – which is the Resource Management Act (1991)'s definition - are effectively wetlands that belong to different hydrosystems.

[1] I note that these terms häpua, coastal lakes and lagoons are sometimes used next to each other in the plan (e.g. policy 4.80), while the term häpua , based on its definition would probably be sufficient – even if I do not entirely agree with that definition (coastal lakes function differently from river mouths with a shallow water body and are two distinct classes of estuarine system)

28. The pCLWRP, and in particular rule 5-138[2], however proposes to exclude from that definition of "wetlands", those wetlands that fall in the lacustrine and riverine hydrosystems. This includes the majority of wetlands in Canterbury (see figure 2).

[2] Rule 5-138 states: "Unless specified otherwise in section 6-15, wetlands, including the margins of rivers, lakes and artificial watercourses, that are contiguous with a river, lake or artificial watercourse and within the bed of the river, lake or artificial watercourse are not considered wetlands for the purposes of Rules 5-139 to 5-142".

Figure 2: Distribution of hydro systems for Canterbury wetlands

29. This has significant consequences for achieving sustainable management of wetlands which I will explain in more detail later in my evidence.

30. New Zealand freshwater wetlands comprise not only a variety of hydrosystems but also a variety of classes (see figure 3). The main classes relevant to the pCLWRP are bog, fen, swamp, marsh, seepage, ephemeral wetland, and shallow open water. Bogs and fens are usually restricted to palustrine hydrosystems but all other types can be found in all hydrosystems.

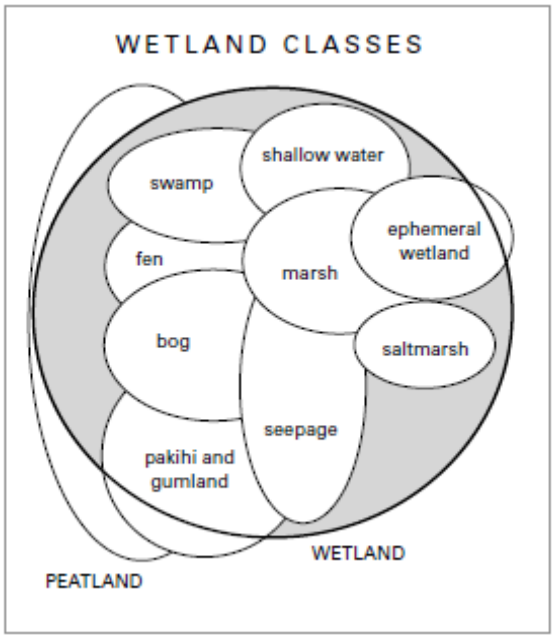

Figure 3: A conceptual arrangement of wetland classes, their relationship to 'peatland' and to 'wetland' as represented by the shaded circle.

31. The two main classes of wetland found in Canterbury are marshes and swamps. As my colleague Dr West notes in his evidence, only 2.7% and 3.1% respectively of these wetland types benefit from being within protected land areas.

32. Marshes have shallow surface water that fluctuates dramatically to the extent that it is often dry underfoot like ephemeral wetlands. Marshes have high nutrient levels and mineral (non-peat) substrates and are often associated with lacustrine and riverine hydrosystems like swamps.

FUNCTIONS AND VALUES OF NEW ZEALAND WETLANDS

33. There are many different functions wetlands perform, not just ecological, and those functions have a plethora of values attached.

34. These functions and values are important to identify as they can assist in recognising the many benefits of wetlands and thus their protection.

35. One of the root causes of much wetland loss and degradation can be information failure - decision-makers often have insufficient understanding of the values of wetlands, including the economic value, so the protection of wetlands does not appear to be a serious alternative.

36. The values and functions of wetlands in relation to resource management have become better recognised in the recent years and efforts have been made to quantify the "free services" and amenities that wetlands provide to society both life-supporting/ecological values and production/socio-cultural values as follows:

- hydrological values/functions (flood storage and mitigation, groundwater recharge/discharge, maintenance of summer base flows, lagoon/estuarine flow modification);
- geomorphologic values/functions (erosion protection);
- chemical values/functions (carbon sinks, nutrient assimilation, sediment trapping and toxicant removal, biogeochemical cycling);
- biological values/functions(Role that the wetland plays in sustaining animal and plant communities - productivity, wildlife habitats and fish nurseries, threatened plant habitat);
- ecological values (role of the wetland in fostering interactions between plant and animal communities (role that the wetland plays in sustaining animal and plant communities - biodiversity, corridors);
- production/socio-economic-cultural values/functions (power generation, commercial fisheries (eeling), peat extraction, plant

harvesting, recreation (whitebaiting), education, cultural and spiritual values).

37. It is becoming increasingly common to group these functions and values under the term of "ecosystem services". Ecosystem services are often described as the benefits people obtain from ecosystems whether directly obtained as provisioning services (i.e. products obtained from ecosystems), regulating services (i.e. benefits obtained from regulation of ecosystem processes) or cultural services (non material benefits obtained from ecosystems – noting that weaving and other traditional materials (including food) wetlands provide for Maori would be a provisioning service as well as a cultural service), or indirectly obtained as supporting services (services necessary for the production of all other ecosystem services – like soil formation, nutrient cycling or primary production).

38. Benefits derived from those services and associated with wetlands have been demonstrated as having high economic values. Thus wetlands contribute to almost half the world's ecosystem services, including flood control and the filtering of pollutants and sediments (Barbier et al. 1997)

39. Wetland ecosystem services have been quantified in dollar values by ecological economists. On a global scale wetlands (includes estuarine and freshwater) are one of the most valuable ecosystems in the world. They are valued at US$10,000–$20,000 per hectare per year, compared with only US$300 per hectare per year for temperate forests (Costanza et al. 1997). In New Zealand, the value per hectare of the ecosystem services provided by freshwater peatlands/wetlands is estimated at NZ$34 184 per annum (Cole & Patterson 1997).

40. The Canterbury wetlands perform as a whole most of these functions (Environment Canterbury Regional Council 2011) and therefore provide a wide range of ecosystem services.

41. Individually, the loss of small wetlands or corners of large wetlands may not have seemed important in the past in relation to some of these values. However, the cumulative effects of these losses have been serious for the native wetland plants, for the fisheries and some birds, both nationally and regionally, including in the Canterbury region.

42. The losses of wetlands also impact on benefits other than biodiversity (e.g. water storage, sediment filtration, nutrient uptake, groundwater recharge, loss of weaving material).

INTERNATIONAL RECOGNITION OF NEW ZEALAND WETLANDS

43. The Directory of Wetlands in New Zealand ("the Directory"), published by the Department of Conservation in 1996 (Cromarty et al. 1996) contains a chapter on Canterbury with a number of sites that were identified as of potential international significance.

44. The Directory is a compilation of what were known, or thought to be at the time, the most important wetland sites throughout New Zealand[3]. The Directory was initiated as part of the Oceania Wetland Inventory which was being prepared under one of the objectives of a joint venture between Wetlands International, the Ramsar Bureau and the South Pacific Environmental Programme. It aimed to identify sites with potential for Ramsar status.

45. The main reason for inclusion of these wetlands in the Directory is because the wetlands are good examples of certain wetland types which are nationally uncommon and vulnerable, good habitats for threatened species and/or important fisheries, and make a contribution to biodiversity.

[3] The Directory is very useful but is not an exhaustive list in my view. It is a list of what was thought to be internationally significant at the time it was compiled. Based on the knowledge that has been gathered since, especially in relation to the development of a wetland typology (Johnson and Gerbeaux 2004) as well as the LENZ tool (Ausseil et al. 2008, 2011) that was developed to assist with the identification of conservation priorities, I believe that more sites would likely be added in order to better increase representation of each type.

46. New Zealand lost approximately 90% of its wetlands over a relatively short period of time – 150 years (reference). This has been noted by wetland experts as one of the greatest in the world (Mitsch and Gosselink in *Wetlands* (Third Edition, 2000)). Even in Europe, countries have often suffered less wetland loss, and also probably over a longer period of time.

47. This is why New Zealand became a signatory to the Ramsar Convention on Wetlands in 1976 (interestingly, it is the only global environmental treaty that deals with a particular ecosystem). New Zealand only has 6 Ramsar sites, none of which are in Canterbury.

48. The Canterbury sites from the Directory that would be worthy of Ramsar status include estuaries (e.g. Avon-Heathcote) and coastal lakes such as Te Waihora – as recently highlighted by Gerbeaux (2011) in the matter of an application to amend the National Water Conservation (Lake Ellesmere) Order 1990. Several braided rivers (e.g. Rakaia) and many high country lakes could also be good candidates.

THE EXTENT OF LOSS OF NZ WETLANDS AND THE IMPORTANCE AND SIGNIFICANCE OF WETLANDS REMAINING WITHIN THE CANTERBURY REGION ESPECIALLY IN THE LOWLANDS

49. Over the years, most NZ wetlands have been turned into pasture or reclaimed for industrial use. Other wetlands have been modified by changes in water levels or polluted with effluent or high nutrient run-off.

50. Wetlands have also suffered from the introduction of aggressive pest plants and animals. As recently as the 1970s, wetlands were still officially listed in many regions as wasteland. By the beginning of the 1980s, nearly 90 percent of North Island and over 60 percent of the original wetlands in the South Island were irreversibly modified in some way. In the process a number of species found nowhere else in the world disappeared (as highlighted in Table 1).

51. Freshwater wetlands (including forested wetlands) originally covered an estimated 2.4 million ha, nearly 9% of the total area of New Zealand (Ausseil et al. 2008). The current total extent of wetlands is estimated to be 249 776 ha, or about 10% of historic extent (Ausseil et al. 2008).

52. Within New Zealand, the greatest wetland loss (in terms of proportion) has been in the North Island (Ausseil et al 2008), with only 4.9% remaining, whereas in the South Island (including Stewart Island), 16.3% remains.

53. The total historic extent of freshwater wetlands in Canterbury was estimated at just under 195,000ha. That was 4.3% of the region by area. Today, the 10.6% of original wetlands left equates to just 0.43% of the region's land area left.

54. The extensive loss of freshwater wetlands means that remaining wetlands, including those found in Canterbury, have a special significance nationally among all ecosystems.

55. In the case of Canterbury, further analysis on wetland loss in the region is provided by Pompei and Grove[4] (2010) – see Table 2 below:

TABLE 2 Historic and current (*c.* 2000) area of wetlands, % area loss, and number of current wetlands for the 10 Canterbury Water Management Zones, as calculated from the Ausseil et al (2008)'s WONI freshwater wetlands database **(from Pompei and Grove 2010)**:

Water Management Zone	Historic wetland area (ha)	Current wetland area (ha)	% loss	Number of 'current' wetland sites
Kaikoura	3,272	208	93.6	34
Hurunui - Waiau	26,504	352	98.7	64
Waimakariri	22,164	1,026	95.4	119
Christchurch - West Melton	4,257	73	98.3	20
Banks Peninsula	241	32	86.7	11
Selwyn-Waihora	47,272	3,102	93.4	340
Ashburton	44,891	5,871	86.9	581

[4] Philip Grove is one the current ECan ecologists

Orari-Opihi-Pareora	18,689	831	95.6	195
Upper Waitaki	20,022	7,843	60.8	420
Lower Waitaki – South Coastal Canterbury	7,621	522	93.2	220
Regional Total	194,934	19,851	89.8	2,004

56. The table reveals some intra-regional differences and provides useful information on which parts of the region were major contributors to wetland extent in Canterbury, with most water management zones having lost well over 90%, beyond the national average. No complacency can therefore be afforded in the future anywhere if wetland biodiversity of the region is to be realistically sustained.

57. The loss of wetlands has been greatest in the lowlands where freshwater wetlands are now largely absent from their former area, and wetland cover, although still reduced, has to date survived best in the western half of the region – the hill and high country, inter-montane basins and valley floors (Pompei and Grove (2010) (see Figure 4)). Most of these would have been riverine swamp wetlands.

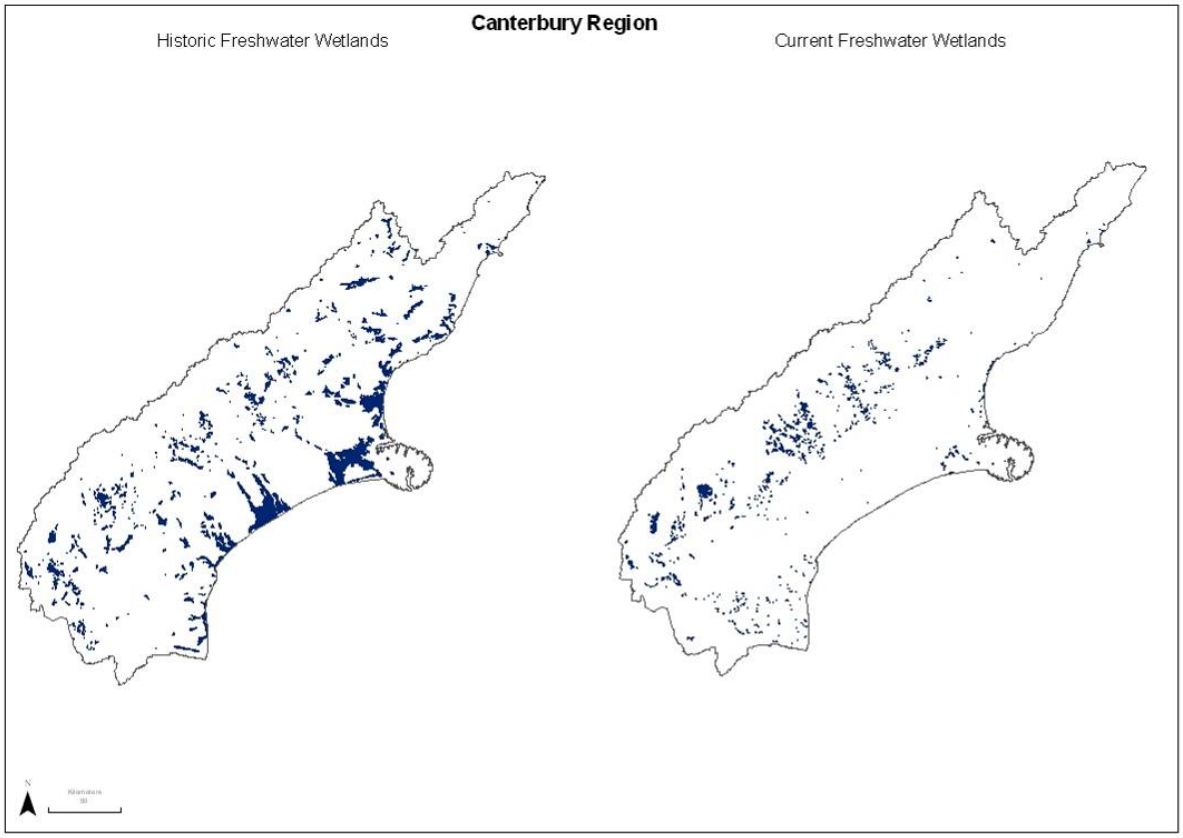

Figure 4 (from Pompei and Grove 2010): Historic and current (*c.* 2000) extent of freshwater wetlands in Canterbury, as derived from the WONI wetlands database (Ausseil et al 2008)

58. It should be noted, especially in the light of my above comment (the "nibbling away" – see 44), that most Canterbury wetlands (84%) mapped by the Waters of National Importance project(WONI) were smaller than 10 ha[5], representing 20% of the regional wetland area, with very few wetlands over 500 ha in extent (the Braemar Road wetland complex being the largest remaining freshwater wetland – 1,570ha), which in total covered 19% (3,148 ha) of the remaining overall wetland area (Pompei and Grove 2010).

59. In light of the above, it is worthy of noting the following advice from the Directory*:*

[5] Keeping in mind that those less than 0.5ha were omitted from WONI, this threshold being imposed by methodological limitations linked to the resolution of satellite imagery. Many sites where the Canterbury mudfish is found are smaller than that.

> *"The greatest single need* (in order to protect wetlands) *is the establishment of buffers of indigenous vegetation along rivers (from their headwaters to the sea), and around the margins of lakes, swamps and estuaries; and the protection of corridors linking wetlands of all kinds to other terrestrial and marine protected areas".*

60. For more details in relation to this, please refer also to my colleague Dr West's evidence (his paragraph 9a in particular).

THE ROLE THAT ANTHROPOGENIC PRESSURES CONTINUE TO PLAY IN THE REGION ON THESE SYSTEMS

61. There is evidence that while wetland loss has slowed compared to the massive reduction that followed the arrival of Europeans in the 19th and 20th centuries, these relatively small wetlands continue to be either a target of development activities through direct pressure or suffer degradation in relation to the indirect impacts of these activities at or adjacent to the sites (Myers et al. 2013).

62. Between 1990 and 2008 it has been shown that at least 144 sites in Canterbury (c.7% of the total sites) had suffered a loss of extent with 102 of them showing significant (more than 25%) reduction in extent, with most of the others losing up to 25% extent (Pompei and Grove (2010).

63. The majority of the loss was located in the western half of the region – the inter-montane basins and valley floors of the high country (MacKenzie basin, Upper Rangitata, Ashburton Basin, Lees Valley), with a few others located in the already largely impacted plain and foothill areas.

64. This loss is a worrying new trend compared with the period preceding last 20 years (there is hardly any wetland left in the lowlands)

65. The major causes or drivers of change in extent for Canterbury wetlands are identified and include:

- drainage,
- diversion of water,
- infilling,
- reclamation,
- urban development,
- fire,
- vegetation clearance,
- cultivation,
- grazing and
- spread of introduced plants (Pompei and Grove (2010)).

66. They are usually acting in combination gradually. Detailed examples of these are also provided by Pompei and Grove (2010).

67. Based on these examples, it was concluded that:

- current programmes of public awareness
- education,
- voluntary protection, and
- Resource Management Act provisions in plans

have not halted loss of freshwater wetlands in the Canterbury region (Pompei and Grove (2010).

68. In the light of all the above, I confirm my view that all wetlands remaining in the region should be regarded as significant, and that planning mechanisms such as the pCLWRP, as suggested in Policy 9-3-2, Method (1) and Policy 9-3-5 Method (1) of the Canterbury RPS (2013), need to reflect this situation by aiming for definitions and plan provisions that are appropriate to protect this ecosystem, as proposed by my colleague Mr Herb Familton in his evidence.

69. The approach to treat, especially in regions where there are few left, all the remaining wetlands as significant, is more and more commonly adopted in New Zealand. Even in regions where more wetland area remains, like the West Coast, what constitutes a significant wetland has been recently tested through a recent Environment Court case (Environment Court of New

Zealand, 2010 and 2012) and, "*the case broadened the definition in the plan to cover the full range of biodiversity, not just highly significant wetlands, and directed that the state and extent of wetlands at a national level are a relevant issue for a regional council plan*" (Myers et al. 2013).

70. In my opinion the pCLWRP does not achieve that very well, and certainly less well than the NRRP (Environment Canterbury Regional Council 2011) was. Myers et al (2013) provide a clear demonstration of how well the NRRP was faring in comparison to other regions (notably in relation to the strengths of its rules).

THE PLACE OF WETLANDS IN THE CONTEXT OF NATIONAL PRIORITIES, MORE ESPECIALLY THE NATIONAL POLICY STATEMENT (NPS) ON FRESHWATER MANAGEMENT, THE NATIONAL PRIORITIES FOR PROTECTING RARE AND THREATENED NATIVE BIODIVERSITY ON PRIVATE LAND AND THE PROPOSED NPS ON BIODIVERSITY

71. Wetlands are identified as key ecosystems in both the National Policy Statement for Freshwater Management (July 2011) (NPSFM) and the Ministry for the Environment's National Priorities for Protecting Rare and Threatened Native Biodiversity on Private Land (April 2007). The proposed NPS on Biodiversity also contains references to wetlands.

72. The section 42A report states (p.383) that the premise of the protection of wetlands as a primary position is the pCLWRP's intent in order to reflect important policy changes contained in the NPS and RPS. However I see little evidence of this in the plan.

National Policy Statement for Freshwater Management (July 2011)(NPSFM)

73. The preamble to the NPSFM recognises the national values of freshwater and components of fresh water's intrinsic values. Those values apply specifically to wetlands.

74. As a wetland expert, I note the importance of the objectives and policies included in the NPSFM as they are directly relevant to wetlands and their management. The implementation of these objectives and policies is essential to maintain the ecological integrity of remaining wetlands.

75. The objectives of the NPSFM cover several important aspects related to wetland management:

- *Maintaining key characteristics of fresh water*
- *Protecting significant values of wetlands and outstanding freshwater bodies*
- *Integrated Management*

76. I am providing below technical comments that may assist you in relation to some of the key objectives of the NPS:

Maintaining key characteristics of fresh water.

77. This relates *to* Objectives A1 and B1:

> "To safeguard the life-supporting capacity, ecosystem processes and indigenous species including their associated ecosystems of fresh water, in sustainably managing
>
> A1: the use and development of land, and of discharges of contaminants
>
> B1: the taking, using, damming, or diverting of fresh water."

78. My comment here under these objectives is that most wetlands are likely to be significant not only as defined by the criteria contained in the Canterbury RPS (although without doing a wetland by wetland analysis I cannot confirm this – I suspect that most in relation to Policy 9.3.1 and using Appendix 3 of the RPS would trigger at least the rarity/distinctiveness or ecological context criteria), but also because they would provide life-supporting capacity, sustain processes and/or host species. The implementation of such objectives applies to all wetlands.

Protecting significant values of wetlands and outstanding freshwater bodies.

79. This relates to Objective A2

> "The overall quality of fresh water within a region is maintained or improved while:
>
> *a.* protecting the quality of outstanding freshwater bodies
>
> *b.* protecting the significant values of wetlands" and…

Objective B4 (relating to water quantity)

> "To protect significant values of wetlands".

80. I refer you here to my introductory paragraphs on the functions and values of wetlands and the important role that wetlands play in any landscape in contributing to the maintenance of both water quantity and water quality. Because the Canterbury region has few wetlands left, the ones remaining become even more crucial to care for in that context.

Addressing past and future allocations.

81. This relates to the last part of Objective A2:

> "The overall quality of fresh water within a region is maintained or improved while
>
> c. improving the quality of fresh water in water bodies that have been degraded by human activities to the point of being over-allocated"

It also relates to Objective B2

> "To avoid any further over-allocation of fresh water and phase out existing over-allocation".

82. A similar comment to the one just above applies to this objective. Wetlands do contribute to maintain the overall quality of fresh water. They can in particular sustain flows in lowland streams.

83. The policies attached to these objectives are in my view very important to also bear in mind as they raise important issues such as climate change (see below), the connection between water bodies issues in relation to the setting of water quality limits (Policy A1), the setting of environmental flows and/or levels for all bodies of fresh water - except ponds and naturally ephemeral water bodies (Policy B1).

84. Wetlands, whether in periods of droughts or floods (which could potentially be increasing in frequency in the future as a result of climate change), can mitigate negative impacts (by storing or absorbing excess water for instance). Note that even a degraded wetland can fulfil such important roles. Policy A3 that imposes conditions on discharge permits to ensure the limits and targets specified pursuant to A1 is equally important

Integrated management.

85. This relates to Objective C1:

> "To improve integrated management of fresh water and the use and development of land in whole catchments, including the interactions between fresh water, land, associated ecosystems and the coastal environment"

86. The Canterbury region is showing some right intent in relation to this objective, especially with the proposed introduction of "water management zones" and I congratulate the Council on such intent.

87. I have some technical and scientific reservations about aspects of the approach which I elaborate on below. However, besides these reservations, I do believe that the Zone Implementation Programmes could be ideally suited to address this NPSFM's objective (C1). It should assist in better integrated

water management at a finer scale while still taking into account the regional framework.

88. The MfE's (2007) statement of national priorities for protecting rare and threatened biodiversity on private land also highlights the importance of wetlands. I note in particular two key priorities that relate to wetlands:

(i) The second national priority aims to protect indigenous vegetation associated wetlands, recognising that these ecosystem types have become uncommon due to human activity (MfE, 2007).

(ii) The fourth national priority aims to protect habitats of acutely and chronically threatened indigenous species. These lists include freshwater fauna that are dependent on healthy wetland ecosystems.

REVIEW OF THE WETLAND PROVISIONS WITHIN THE CLWP

89. I will now review the wetland provisions within the proposed plan as they relate to:

- definitions
- policies
- rules in general
- the impacts on the remaining wetlands if the provisions in the CLWP are implemented.

Definitions

"Wetland", as modified by Rule 5.138

90. A first major concern to me is the modification of the definition of "*wetland"* by Rule 5.138.

91. As highlighted in the Director-General of Conservation's (DOC) original submission, rule 5.138 reads like a definition and has the effect of modifying the normal meaning of "wetland" by stipulating certain wetlands are not in

fact wetlands for the purposes of rules 5.76-100 (which I discuss further below).

92. The rule's insertion in the plan creates the need for a robust methodology related to the delineation of the beds of lakes and rivers because if mapping of hydrosystems can be done at a coarse level, it is often not possible to precisely demarcate boundaries at a detailed level of mapping. This task becomes more practicable with the lower level of the classification system (at the class or structural class levels or in particular – see Johnson and Gerbeaux 2004).

93. The delineation of lake beds in particular, can prove extremely difficult without access to long-term hydrological data and detailed digital elevation models. While river banks can be often relatively easily identified on the ground[6], especially when banks are present, it can prove particularly difficult to identify the boundary between a lake bed and its margin. This issue was discussed in a decision of the Environment Court (Decision No. C 19 /2006) in respect of some farm development work done on a farm property adjacent to Lake Brunner at Iveagh Bay.

94. Based on the information provided in my previous sections, especially in section B (on classification), and in sections E and F, (on the extreme loss of wetlands in New Zealand and in the region), I cannot support rule 5.138: all wetlands need to be treated in my view in the same way. The rule should be deleted.

95. As my colleague Dr Dunn notes in his evidence (paragraph 72), it is important to note that the freshwater fish that depend on wetlands often do not distinguish between those wetlands which are outside the margins of lakes or

[6] the riverine hydrosystem extends only so far as flowing channels retain a current influence, which can be defined as the extent covered by the mean annual flood (Johnson and Gerbeaux 2004) or, as defined by the pLWRP (from section 2 of the RMA 1991) under the "bed" definition, as "the space of land which the waters of the river cover at its fullest flow without overtopping its banks"

rivers (palustrine wetlands) and those that lie within them (riverine or lacustrine wetlands). Thus, drawing a distinction between these classes of wetland does not make sense in terms of native freshwater fish and invertebrate habitats for that matter.

96. Wetlands in the margins of lakes and rivers, whether within their beds or not, also play, beyond their biodiversity role, an extremely important buffering function encapsulating most of the ecosystem services referred to in my earlier paragraphs in section C.

97. Not having regard to these important functions of riparian wetlands is a fundamental mistake if this plan is serious about sustaining the future water quality of our lakes and rivers.

98. The pCLWRP does not acknowledge this at all and needs, in my opinion, to treat all wetlands, including lacustrine, riverine (especially where banks cannot be easily and clearly identified) and palustrine hydrosystems the same way.

99. Rule 5.138 also defeats the purpose of policies 4.82 and 4.83 as before restoring and enhancing riparian wetlands it is logical and preferable in my view (and less costly) to keep what currently still exists in term of the natural protection (as a buffer) around lakes and rivers.

Rules 5.76 – 5.100

100. Because of rule 5.138, wetlands, including the margins of rivers, lakes and artificial watercourses, that are contiguous with a river, lake or artificial watercourse and within the bed of the river, lake or watercourse, are not considered wetlands for a suite of rules (5.76-5.100).

101. The effect of rule 5.138 exposes these places to a number of permitted and restricted discretionary activities that could have serious and possibly

irreversible effects. Any proposal to carry activities in wetlands needs consideration on a case by case basis, rather than being allowed to take place without full knowledge of the type of wetland under scrutiny and consideration for adverse effects.

102. In my opinion all wetlands need to be treated in the same way (in the main part of the pCLWRP or in section 6-15).

"Wetland boundaries"

103. A second major concern to me is the '*wetland boundary'* definition contained in section 2.10 of the pCLWRP: "*means the point in the transition from wetland to dryland where wetland plant species occur at more than four times their ungrazed height apart. Wetland edge has a similar meaning*".

104. Because of the definition of "wetlands" stated in rule 5.138, the question of whether or not such wetlands are part of a lake or river bed also requires delineation of the bed boundary of these hydrosystems on the ground. Something I regard almost impossible to do.

105. I am uncertain how the existing definition came about as it has in my view no scientific and/or ecological validity. A more ecologically sound definition for the wetland boundary should be inserted in the pCLWRP, to be replaced with: *'Wetlands are defined by the presence of three diagnostic environmental attributes or criteria; hydrophytic vegetation, hydric soils, and water – above, at, near or below the substrate surface, are required for a site to be a wetland. The wetland boundary (from wetland to dryland/upland) corresponds to where one of those criteria is not present anymore'.*

106. Determining hydrophytic vegetation[7] is a key tool to delineate wetland-land boundaries. Under the Ministry of Business, Innovation and Employment "Restoring Wetlands" research programme led by Landcare Research, native

[7] Hydrophytic vegetation is defined herein as the sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present.

and non-native species of New Zealand wetlands (hydrophytes) have been recently classified according to the typical habitat in which they grow: obligate wetland (OBL), facultative wetland (FACW), facultative (FAC), facultative upland (FACU) or obligate upland (UPL).

107. The vegetation criterion described above requires that over 50% of dominant species are OBL, FACW or FAC to be met. The method requires a plot based (species composition, cover and OBL etc classification) to determine where the wetland starts and stops. This vegetation criterion is believed to work for most (90-95%) wetlands in New Zealand.

108. Only pakihis, gumlands and ephemeral wetlands are thought to require extra soil and hydrological information.

109. This project came about precisely in order to resolve on-going outstanding issues that relate to regional and district plans that identify a wetland boundary definition without attaching a scientific method to determine how to do it.

110. However, while under the RMA's (and pCLWRP's) definition, lakes are wetlands in their own right, avenues have been recently suggested to clarify this boundary between '*lake*' and *'wetland* as this makes sense from a planning perspective.

111. Delineation of the wetland/lake boundary was for instance considered by a wetland panel working towards defining national standards for wetlands under the National Objectives Framework for Freshwater (Robertson et al *2013*).

112. Definition of a wetland was suggested to be based on a functional depth limit based on what emergent or amphibious plants can tolerate - often in the

order of 2.0m. However, if emergents, shrubs, or trees grow beyond this depth at any time, their deepwater edge is the boundary.

113. This definition has merit as emergent plants are always visible from aerial photographs and such boundary can also be more easily mapped or recognised on the ground than when using the bed boundary definition proposed in the pCLWRP and RMA.

114. It also acknowledged that besides deep open water (the lake), lacustrine hydrosystems have large, shallow water areas that can be referred to as wetlands (under the pCLWRP's wetland definition), as identified by Johnson and Gerbeaux (2004) when they identified the need for a shallow water wetland class (see figure 3). Alternatively many lakes have bathymetric maps and the 2m depth contour could be identified from those maps.

Riparian margins

115. I do not support the decision in the s42A report to reduce the width of riparian margins as it applies to wetlands, to 10m in in Hill and High Country land and 5 m in all other land not shown as high soil erosion risk on the planning maps…(see section 9.2 under the definition of riparian margins).

116. First the question might be asked here is whether, without an agreed consistent methodology to delineate boundaries of beds and wetlands, it is wise to start discussing what an appropriate buffer might be for wetlands, including lakes and rivers. In my opinion the immediate focus should be to resolve the boundary definition issue that I have previously discussed.

117. The width of buffers and margins for wetlands differs from plan to plan around New Zealand. A buffer of 30m has been used in the assessment made in the WONI project regardless of the slope because it enabled a suitable assessment at a GIS scale. I however agree that more buffer width is required

on steep land. I would certainly regard the 20m width as a minimum for estuarine, palustrine and lacustrine hydrosystems which are more often more sensitive than riverine systems, due to the lack of flow. Maintaining a 30m buffer for all wetlands would enable similar GIS analyses to be performed under for instance the NOF framework.

Other Policies and rules

Rules applying to discharges and water takes

118. The rules enable the release of unlimited amounts of land drainage water into wetlands. I have highlighted in the early part of my evidence the ability of wetlands to perform a number of ecosystem services.

119. While wetlands often are able to take up nutrients and filter sediment, there is a limit beyond which their absorbing capacity is exceeded. The conditions attached to those rules do not seem to address the specificity of wetlands (compared with lakes and rivers) and may not prevent a change in those wetlands that is not going to meet the NOF standards. Hence again my request to include wetland outcomes in Table 1.

Changes to Table 1

120. While Policy 4.1 makes specific reference to wetlands, Table 1 (related to outcomes for freshwater bodies) and sections 6-15 appear to largely ignore wetlands, yet, like for rivers, lakes and aquifers, appropriate indicators for wetlands are becoming available for New Zealand wetlands (see Robertson et al 2013) and should be used to ensure that freshwater wetland outcomes are appropriately established for each management zone. Robertson et al (2013) found the National Objectives Framework (NOF) to be workable and of high potential value as an approach to setting local, regional and national objectives for wetlands. They also noted that the draft NOF is well enough advanced to provide a clear indication of the sorts of bands that would be

appropriate, and the potential implications of possible bottom lines, while noting the NOF for wetlands may require further refinement and peer review.

121. For wetlands, Robertson et al (2013) identified three objectives that would be potentially recommended as requiring national bottom lines, which councils must address to ensure that all wetlands retained basic ecological functioning. The three bottom lines are:

- Hydrological alteration – "change in water source that resulted in a complete shift in wetland type and/or change in dominant vegetation"

- Nutrient status – "nutrient levels outside natural range and have caused a major shift in biotic composition"

- Wetland extent – "O:E wetland extent less than 0.2", i.e. less than 20% of historic wetland extent remaining (note: threshold level still being discussed).

122. The second bullet point is very relevant to Table 1 and on that basis, I support my colleague Mr Herb Familton's proposition to add a table for wetlands specifically. Physico-chemical alteration (e.g. changes in nutrient/sediment inputs) is often due to modified water levels and water quality associated with land use change.

123. Figure 5 confirms that changes do occur in agricultural catchments. It illustrates the general differences in wetland condition of remaining wetlands (applying a qualitative assessment method) between agricultural and indigenous catchments.

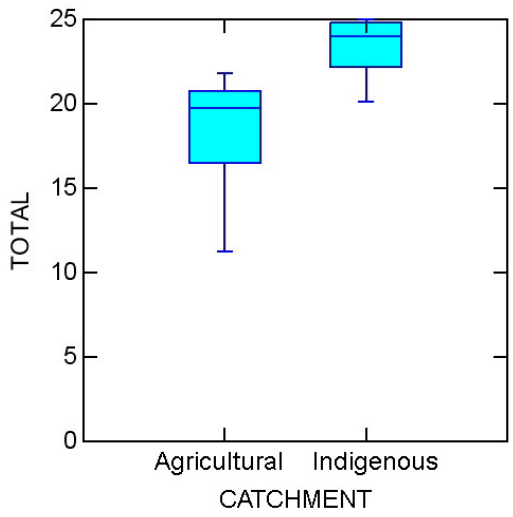

Figure 5: A relative comparison of wetland ecological integrity in agricultural and indigenous dominated landscapes as derived from a condition index.
Source: B. Clarkson pers. comm. 2012

124. Generic measures of wetland health (also referred to as ecological integrity) are possible. They always integrate water quality parameters and recognise that the specific environmental drivers that influence wetland condition vary from catchment to catchment, and between wetland types. Therefore, it is necessary to identify objectives for specific parameters such as water quality and preferable to follow recommendations proposed by the NOF. I recommend that the Council consults the draft report and/or approach members of the panel, and integrates this work in Table 1.

Wetlands outside lakes and rivers in section 6-15

125. While the definition of "water body" makes reference to wetlands no such wetlands outside beds or rivers and lakes appears, as recommended under Policy 4.5, to have been identified in Sections 6-15 of the PLWP. Yet, by referring clearly to '*high naturalness*' waterbodies and giving regard to the definition of water bodies in the pCLWRP it was anticipated to see some wetlands outside beds of rivers and lakes also listed in those sections of the plan.

126. One such example of important wetlands missing out is the wetlands along the north-west margin of Lake Heron and those surrounding Maori Lakes (see figure 6 below).

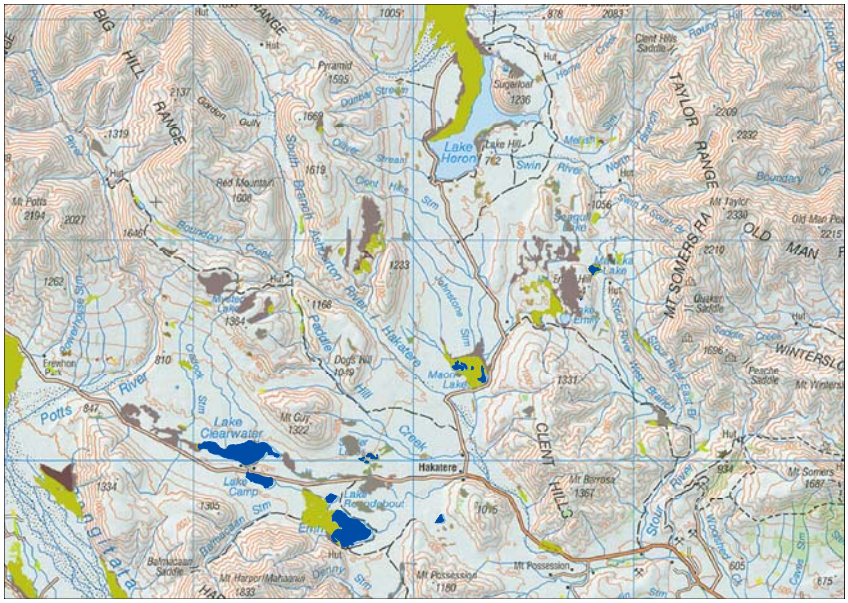

Figure 6: A map of wetlands present in the O Tu Wharekai/Ashburton Lakes catchment. (The blue polygons represent the high naturalness waterbodies as identified in the pCLWRP)

Three issues can be identified from this example:

- Lake Heron despite being identified in several documents (including the Directory of New Zealand wetlands (Cromarty et al 1996) as significant it is not retrieved in the list of high naturalness waterbodies;
- The wetlands surrounding Maori Lakes are not being given *'high naturalness*' status (the boundaries that were applied appear to stop at the edge of the open water of the lakes). Yet, based on my knowledge of the site, they are within the bed of the lakes (at least the light green area on figure 6) and should be picked up;
- Because Lake Heron is not picked up, the wetland contiguous to it, which technically speaking is (at least for some of it) part of the '*bed*' of the lake and the rest part of the '*margin*' , is therefore not a '*wetland*'. My colleague M. Nick Head has included a photo of that wetland in his evidence (photo 2 in Appendix 2) in order to illustrate the damage caused by cattle in that area.
- A similar situation occurs for the wetland polygon surrounding Maori Lakes which is not part of the high naturalness area (although here the lakes proper are retrieved as '*high naturalness*" areas). All these

polygons may therefore lack crucial protection mechanisms under the pCLWRP. I would be therefore very concerned, both for the wetlands and for the lakes by the lack of controls applying to those wetland areas.

127. Acknowledging my previous statements above, where I regard all remaining wetlands as significant in the Canterbury region, I recognise the usefulness of identifying where investment priorities should take place for wetlands, especially in relation to the policies encouraging wetland enhancement and/or restoration (4.81 and 4.82).

Tools for identifying wetlands that need restoration and/or enhancement (Policies 4.81 and 4.82)

128. With a view to help with the identification of wetlands that need restoration and/or enhancement in Canterbury, I recommend to use the FENZ/WONI wetland layer, as set out in DOC's submission. My colleague Dr West explains the FENZ tool in more detail in his evidence.

129. An ecological integrity index is provided as part of the FENZ tool. It is included as part of a layer developed by Ausseil et al (2008). It was measured at less than 0.5 on a scale from zero to one (from bad condition to good condition). Significant human induced disturbance pressures were found in over 60% of the New Zealand wetlands.

130. These results clearly reflect the high levels of human-induced disturbance pressure and probable loss of naturalness and associated biodiversity in New Zealand wetlands. Figure 7 below shows that that for the key three freshwater biogeographic units present in the Canterbury region (Banks Peninsula, Canterbury and Waitaki[8]) the mean ecological integrity index (EI)

[8] note that small parts of another biogeographic unit of Marlborough are also in Canterbury

related to each unit are nationally among the lowest scores. By combining this index with complementarity and irreplaceability[9], many wetlands from the Canterbury region have thus been ranked. And many (especially large ones) are retrieved as being above the regional mean, while others with a low score EI can also be ranked highly. This is essentially why I believe that all wetlands in Canterbury should be treated initially as significant as most need to have the highest level of planning protection under the plan regardless of being within a lake or river bed.

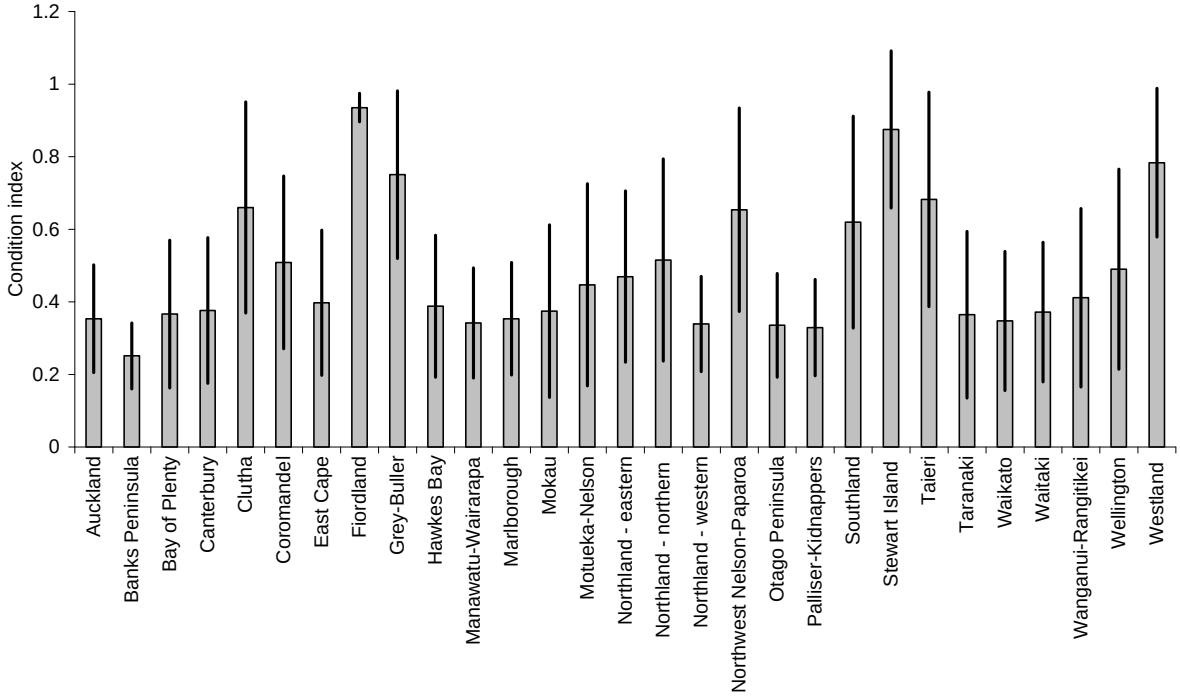

FIGURE 7: Mean condition index (and standard deviation) of all New Zealand wetlands in each biogeographic unit (from Ausseil et al 2008)

131. FENZ ranking helps not only with prioritising protection needs for lakes and rivers as highlighted by Dr West in his evidence but it also helps with prioritising management investments for wetlands. The best management return can often be associated with smaller wetlands which, once retrieved by either aerial photography and/or field surveys and integrated into such GIS

[9] Complementarity ensures that each new area selected complement the diversity of sites already chosen while irreplaceability considers the scale of habitat loss to identify threatened habitats at the biogeographic scale. My colleague Dr West also refers to this in his evidence.

tool, can be compared to others and ranked. The highest ranked sites are potentially where the Council can make a useful contribution towards progressing policy 4.81, restoration or enhancement of wetlands.

132. The inclusion of a layer containing threatened species data (not currently included in FENZ) could be done at the regional scale and would refine the ranking and enable to potentially retrieve those small polygons that contain such threatened species. In that respect the extension of Schedule 17 proposed by DOC is very important.

133. The data layers associated with WONI/FENZ form in my view a useful decision-support tool in that respect. They are available as spatial layers delivered to management agencies to help them identify sites contributing most to regional wetland biodiversity and can supplement the approaches proposed by the Council in each management zones in sections 6-15.

134. Finally, in relation to prioritisation approaches, it should be noted that in the recent development of its second generation consolidated regional policy statement and regional plan (the One Plan), the Manawatu-Whanganui Regional Council introduced novel methodologies for identifying significant natural areas in accordance with the RMA. The proposed approach (Maseyk 2007) essentially relies on compiling a schedule of habitat *types* (which are described in a table) instead of discrete sites. It allows for the determination of significance to be done remotely and thus, more cost efficiently and more completely than methodologies underpinned by field survey, or site-by-site assessment.

135. As highlighted by Myers et al (2013) wetlands in the One Plan are treated very carefully having the highest score in relation to the strength of rules in proportion of the wetland area left in the region (see their figure 2). It should therefore be regarded as a reference in the development of future regional plans. The WONI/FENZ tool (Ausseil et al 2008) has proven to be most useful in order to identify threatened, rare and at risk wetland habitats while

Johnson and Gerbeaux (2004) have provided the basis for the description of these wetland habitats. An identification of all wetland habitats could be performed in each of the management zone (see my Table 3 above) and would provide a rationale much more robust, ecologically speaking than the current ad hoc approach used in the sections 6-15 of the pCLWRP.

136. The One Plan also contains a table explaining what criteria (such as minimum size) applies depending on whether they are threatened or rare (see Table E.2 (a) in Schedule E of the One Plan or what human-induced habitat would not qualify as threatened or rare habitat (see Table E.2 (b) in Schedule E (thus for instance excluding paddocks subject to regular flooding**.**

Rule 5.141, Policy 4.80 and biodiversity offsets

137. In some respects I support the reference to offsets, under rule 5.141 in the pCLWRP. However, the breadth of application of the term is unclear, as the terminology is usually referred to as "biodiversity offsets". Limitations on the use of biodiversity offsets are set out in Policy 9-3-6 of the Canterbury RPS, and the Reasons and Explanations which follow that Policy provide useful guidance, however I would add a few comments.

138. First I would like to emphasise the meanings currently associated with the term "Biodiversity Offset" under the BBOP ("Business and Biodiversity Offset Programme").

139. I have become familiar with this concept during my time with IUCN[10], and also more recently under my Oceania regional networking role with the STRP of the Ramsar Convention, as the Panel was instructed by the 10th Meeting of the Contracting Parties (COP10) in 2008 to "develop guidance on mitigation of and compensation for losses of wetland area and wetland values, including lessons learned from available information on implementation of 'no net loss' policies..

[10]IUCN. 2004. *Biodiversity Offsets: Views, Experience, and the Business Case*. IUCN, Gland, Switzerland.

140. The pCLWRP refers to offsets as aiming to achieve no net loss and preferably a 'net gain'. The outcome should therefore address both the areal extent and the functional performance of the wetland. It is also necessary to understand the range of ecosystem services provided by the wetland, its physical size, and the type of biodiversity a wetland supports prior to considering and developing compensatory habitat.

141. The principle of '*like for like*' in the context of biodiversity offsetting is important in that respect and I reiterate here my view of the need to understand differences between hydrosystems. Any impact on any type of wetland (for instance, an area of a riverine swamp wetland – e.g. a flaxland and sedgeland swamp) that cannot be completely avoided or minimised, rehabilitated or restored as the result of an activity, should be compensated by the rehabilitation, restoration or creation of a similar wetland type (i.e. another area of riverine swamp wetland containing flax and sedges rather than, for example, an area of lacustrine swamp containing the same species.

CONCLUSIONS

142. New Zealand's wetlands, including those present in the Canterbury region, include a number of wetland hydrosystems and wetland classes. They hold important functions and values that provide many ecosystem services.

143. Many of them are internationally significant. About 90% of the original New Zealand Wetland cover has been lost and the extent of loss of wetlands within the Canterbury Region compared with other parts of the country is one of the highest, especially in the lowlands.

144. Anthropogenic pressures continue to be the major drivers of change in extent and loss of wetlands nationally and in the Canterbury Region. Voluntary and educational tools and Resource Management Act provisions in plans have not halted the loss of freshwater wetlands in the Canterbury region.

145. Stronger policies and rules in the pRLWP would appear to be required to stop this decline.

146. It is not scientifically or ecologically logical to treat riverine and lacustrine wetlands as anything other than wetlands, otherwise.

147. Only when the essential definitions are redrafted and ecological principles appropriately recognised, will I be able to support the Canterbury pCLWRP. In my expert opinion, all wetlands should be recognised as significant in the region and given appropriate protection, as all wetland types are threatened, rare or at risk, in the lowlands especially, or contributing to maintaining water quality of important recreational lakes and upper river catchments in the Hill and High Country.

148. Offsets for wetlands should be regarded as a last resort, and potential impacts should be at all costs avoided, minimised, or be addressed with options for rehabilitation or restoration before offsets are considered.

Philippe Gerbeaux

4 February 2013

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