

**BEFORE THE HEARING PANEL APPOINTED BY THE CHIEF FRESHWATER  
COMMISSIONER FOR THE FRESHWATER PARTS OF THE PROPOSED OTAGO  
REGIONAL POLICY STATEMENT**

**AT DUNEDIN  
KI ŌTEPOTI**

**IN THE MATTER**

of the Resource Management Act 1991

**AND**

**IN THE MATTER**

of the proposed Otago Regional Policy Statement 2021  
(for those parts determined to be a Freshwater Planning  
Instrument)

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**Expert Evidence of Bruce McKinlay (Technical Advisor Ecology)  
for the Director-General of Conservation Tumuaki Ahurei  
Dated 28 June 2023**

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## **Introduction**

1. My name is Bruce McKinlay.
2. I am employed as a Technical Advisor Ecology in the Biodiversity, Visitor, and Heritage Group of the Department of Conservation (DOC or the Department). I have a Post-graduate Diploma of Wildlife Management from the University of Otago. I have worked in Otago and Southland on conservation tasks since 1981. I have undertaken ecological/fauna surveys, ecological assessments, species monitoring, Tenure Review surveys, and provided ecological management advice throughout Otago.
3. Since 2013 I have worked nationally on a range of species and ecosystems projects mainly supporting departmental managers with technical advice. I have authored or co-authored 24 peer reviewed science articles, 29 conference presentations, and seven published technical reports.
4. As part of my role, I am the DOC representative to the East Asian-Australasian Flyway Partnership where I advocate for the conservation of habitats and populations of migratory birds which spend the non-breeding season in New Zealand.
5. In the context of this proposed Otago Regional Policy Statement, I have worked on projects relating to the assessment of ecological values on pastoral leases, protection of species and the development of technical advice throughout Otago. I have been involved in the research and conservation of invertebrates, riverine birds, wetland species and marine species at many sites throughout Otago.
6. I am currently the President of the Ornithological Society of New Zealand (trading as Birds New Zealand), and I am a member of the New Zealand Ecological Society.
7. I am presenting this evidence for the Director-General of Conservation in relation to the Director General's submission dated 5 December 2022 on the notified proposed Otago Regional Policy Statement Freshwater Planning Instrument Part (FPI) and the further submission dated 3 February 2023.

## **Code of Conduct**

8. I confirm that I have read the code of conduct for expert witnesses as contained in Appendix 3 of the Chief Freshwater Commissioner and Freshwater Hearings Panels Practise and Procedure Note 2020.
9. I have complied with that code of conduct when preparing my written statement of evidence and will do so when I give oral evidence at the hearing.
10. The data, information, facts, and assumptions I have considered in forming my opinions are set out in my evidence to follow. The reasons for the opinions expressed are also set out in the evidence to follow.

11. Unless I state otherwise, this evidence is within my sphere of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.
12. For the discussion on the assumptions in the NZTCS manual I rely in part on a conversation with the lead author.
13. The discussion on ephemeral wetlands at paragraphs 25-35 below, relies on the content of Peter Johnson & Phillippe Gerbeaux's 2004 publication "Wetland Types in New Zealand" (Johnson and Gerbeaux 2004).

### **Scope**

14. I have organised this evidence to reflect the chapter headings used in the Section 42A Report for the Proposed Otago Regional Policy Statement: Freshwater Planning Instrument, dated 2 June 2023 ('s 42A report').
15. Within this structure, I have been asked to provide evidence in relation to:
  - The ecological basis for establishing time frames for management.
  - The ecological values of ephemeral wetlands.
  - The drylands context that is present in Otago.
  - Delineation of the Freshwater Management Units ('FMUs').
16. I have read the Otago Regional Council's Proposed Otago Regional Policy Statement 2021,<sup>1</sup> the Otago Regional Council section 32 Evaluation Report: Consideration of alternatives, benefits, and costs<sup>2</sup>, and the appendices, particularly 12,13 & 14, and the section 42A reports dated April-May 2022, and the s 42A report dated 2 June 2023. I have also retrieved other relevant documents to inform this evidence.

### **Executive Summary**

17. Tools to estimate the risk of extinction utilise time-based assessments and other criteria to give guidance. These are complex processes as they seek to reflect a large variety of biological data into one headline statement.
18. Deferring management responses to respond to invasive species or other ecological pressures can lead to loss of diversity and ecological intactness. Cumulative impacts are recognised as being present in Otago with the risk of tipping points being reached.
19. Ephemeral wetlands are small habitats and threatened ecosystem in Otago. They are diverse in their form and function. They have been identified in previous research as diverse and holding high species richness. They have been reported as containing

<sup>1</sup> <https://www.orc.govt.nz/media/10027/proposed-otago-regional-policy-statement-june-2021.pdf>

<sup>2</sup> <https://www.orc.govt.nz/media/10030/section-32-report-v61.pdf>

20.6% of native flowering plants species, and an even higher proportion (29.3%) of monocots species.

20. Ephemeral wetlands can be contrasted with Inland Saline Inland Sites (which are unique to Otago) by having a larger range of hydrological contexts, a larger flora which include not only salt tolerant herbs and grasses but also species which are not salt tolerant but are water tolerant.
21. Ephemeral Wetlands are worthy of specific mention in the RPS as current wetland definitions do not always recognise their processes or values.
22. Inconsistencies in the mapping of the coastal margin of the Freshwater Management Units (FMU) have occurred. The coastal margin is again a complex matrix of plant and animal communities that are spaced in the environment according to (among other factors) the ratio of freshwater and salt water. Consistently applying the definition in Clause 1.5 of the NPSFM needs to occur to promote effective management.
23. Dryland ecosystem processes underpin much of the context of water usage in Otago. Drylands are much reduced in extent, suffer ongoing loss and fragmentation, support a rich diversity of plants and animals, and support a disproportionately high number of threatened and rare species,
24. Consequently, specific mention in the RPS that water and land management occur in the context of a dryland ecosystem is justified.
25. Otago is the location of a number of large mostly intact wetland complexes. Some are specifically mentioned in the PORPS. Others are not, even with the same range of ecological and biological values. I set out a justification for recognising all of these in the Regional Policy Statement.

### **The ecological basis for establishing timeframes for management**

26. Paragraphs 202-203 of the s 42A report request additional evidence on appropriate timeframes for achieving freshwater visions. There are various types of evidence that could address this issue. I confine my evidence to approaches utilised in the ecological literature to track movement between the threat classification of endangered species.
27. Previous system tools have attempted to establish a basis for the timeliness of choices when assessing threat classification or risk of extinction. In discussing the IUCN System for Classifying Threatened Species (better known as the Red List), G.M. Mace (Mace, Collar et al. 2008) and colleagues made the following points:
  - Time-based measures in the criteria are scaled for the different rates at which taxa survive and reproduce, and generation length is used to provide this scaling. In the criteria, timescales are set to generations when they relate to biological processes.
  - Because mature individuals of different species have very different average life spans (from hours to millennia), the period over which declines are measured is expressed in generation lengths. Generation length acts as a surrogate for turnover rates within populations.

- Long-lived species are at greater risk from increased annual adult mortality rates (measured as percentage of loss per year) than short-lived species because breeding adults experience this mortality over more years.
  - A long-lived species declining at the same rate as a short-lived one (measured as percentage of change per generation) shows smaller reductions over time (measured in years).
28. The NZ Threat Classification System (Townsend, Lange et al. 2007) Manual adopts a similar approach to the Red List, with the difference that it includes a specific 10 year timeframe. Figures in the Manual are all headed with:
- “Note that population changes are calculated over 10 years or three generations, whichever is longer.”
29. The option to use different timeframes (10 years or three generations) has been described to me by Andrew Townsend (who is lead author for the New Zealand Threat Classification Manual, (Townsend, Lange et al. 2007)) as a practical response to the diversity of biodiversity: i.e., some life cycles are annual<sup>3</sup> and some species live for much longer. This approach was seen as a practical choice by experts, in the knowledge that others will have to apply the system in a variety of contexts.
30. However, there is a rationale to the timeframes employed. Ten years gives the opportunity to pick up a trend over time, allowing for a better assessment for species with a sporadic and cyclic non-natural or natural, (including climate, processes and events) recruitment that, when not observed annually, could result in a misinterpretation of the trajectory of the population. Conversely, a species which is, for example, an annual plant and is monitored over ten years provides a more detailed set of data to make an assessment.
31. Equally difficult is understanding how much time a deadline should be given to reduce or remove the underlying pressures or threats that ecosystems face. For example, when considering the terrestrial case of wilding conifers, assessing when the duff layer of shed needles that covers the ground has an irrevocable effect on the soil profile and indigenous fauna that inhabit that soil is challenging.
32. In a freshwater context, consider the impact of invasive willows (*Salix* spp.) on wetland functioning, water flow and quality. Willows can invade an open riverine or lake wetland and can have the effects of altering wetland processes by clogging up water channels and changing the rate at which water, sediment and nutrients flow in and out of the wetland, reducing available habitat for threatened and at risk species of fish and plants.
33. Deferring a response risks passing an irreversible threshold where a new ‘undesirable’ ecological community dominates or becomes the new normal.
34. While I am sceptical that there is any one clear ecological basis for setting timeframes in a regional policy statement, one matter that I am not sceptical about is that failure to

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<sup>3</sup> An annual lifecycle is completed within a year. Eg insects, some plants. Longer-lived species can be referred to as perennial.

address the population trend issues that threatened species face, (including declining quantity and quality of habitat, inappropriate land use, or other activities) does increase the risk of extinction. Further, SRMR-I11 states:

“Cumulative impacts and resilience - the environmental costs of our activities in Otago are adding up with tipping points potentially being reached.”

I discussed the relevance of this statement in my evidence on the PORPS dated November 2022 (para 136-143). The discussion in these paragraphs addresses integrated management but parts are equally relevant to the timeliness of action.

### **The ecological values of ephemeral wetlands**

35. In her submission (5 December 2022) on LF-FW-O9, the Director General sought to have included a reference to ephemeral wetlands. The s42A report rejected this submission, noting the phrase “intermittently wet areas” includes ephemeral wetlands. In my view, in the context of Otago, ephemeral wetlands are worthy of specific recognition in the RPS.

36. Clause 3.21 of the NPS Freshwater Management (as amended<sup>4</sup>) defines a **natural inland wetland** by setting out what it is not:

means a wetland (as defined in the Act) that is not:

- (a) in the coastal marine area; or
- (b) a deliberately constructed wetland, other than a wetland constructed to offset impacts on, or to restore, an existing or former natural inland wetland; or
- (c) a wetland that has developed in or around a deliberately constructed water body, since the construction of the water body; or
- (d) a geothermal wetland; or
- (e) a wetland that:
  - (i) is within an area of pasture used for grazing; and
  - (ii) has vegetation cover comprising more than 50% exotic pasture species (as identified in the National List of Exotic Pasture Species using the Pasture Exclusion Assessment Methodology (see clause 1.8)); unless
  - (iii) the wetland is a location of a habitat of a threatened species identified under clause 3.8 of this National Policy Statement, in which case the exclusion in (e) does not apply

37. At a supra class level<sup>5</sup> (specifically in this context, hydrologically), ephemeral wetlands can be of the following types:

<sup>4</sup> <https://environment.govt.nz/publications/national-policy-statement-for-freshwater-management-2020-amended-february-2023/>

<sup>5</sup> Johnson, P. and P. Gerbeaux (2004). Wetland Types in New Zealand. Wellington, Department of Conservation.

- **Palustrine** =freshwater wetlands fed by rain, groundwater, or surface water, but not directly associated with estuaries, lakes, or rivers;
  - **Riverine** = wetlands associated with rivers, streams, and other channels, where the dominant function is continually or intermittently flowing freshwater in open channels; the riverine hydrosystem extends only as far as flowing channels retain a current influence, which can be defined as the extent covered by the mean annual flood; or
  - **Lacustrine** =wetlands associated with the 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.
38. Within this categorisation, and dependent upon substrate, water regime, nutrients and pH<sup>6</sup>, Johnson and Gerbeaux (2004) define “Ephemeral Wetland” as:
- “A distinctive class most frequently found in closed depressions lacking a surface outlet, in climates where seasonal variation in rainfall and evaporation leads to ponding in winter and spring, and with fluctuation so pronounced that it can lead to complete drying in summer months or in dry years. Water source is groundwater or an adjacent water body. Substrates are usually wholly mineral, upon an impervious underlying horizon. Water flow is slow to nil, nutrient status moderate, and pH neutral. Vegetation is a characteristic marginal zone of turf and sward, and sometimes also rushland and scrub. Extreme cases of ephemeral wetland alternate between aquatic and terrestrial plants at different seasons.”
39. In their review of ephemeral wetlands in New Zealand, Johnson and Rogers (Johnson and Rogers 2003) highlighted the importance of the botanical values present in such small and vulnerable wetlands. They summarised species richness of ephemeral wetlands as containing 20.6% of native flowering plants, and an even higher proportion (29.3%) of monocots<sup>7</sup>. In their assessment of naturally uncommon ecosystems in NZ, Holdaway and colleagues ranked ephemeral wetlands as a critically endangered ecosystem based on an assessed >- 90% decline over the previous 500 years. They noted the presence of 28 species of threatened plant species in this ecosystem (Holdaway, Wiser et al. 2012).
40. Ephemeral wetlands can be contrasted with Inland Saline Inland Sites (which are unique to Otago) by having a larger range of hydrological contexts and a larger flora, which include not only salt tolerant herbs and grasses but also species which are not salt tolerant but are water tolerant. Accordingly, defining and recognising ephemeral wetlands is more complex than simply being ‘intermittently wet’.

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<sup>6</sup> It is a scale used to specify the acidity or basicity of an aqueous solution.

<sup>7</sup> **Monocotyledons** or monocots are grass and grass-like flowering plants, the seeds of which typically contain only one embryonic leaf, or cotyledon. They constitute one of the major groups into which the flowering plants have traditionally been divided. The largest family in this group by number of species are the orchids with more than 20,000 species. About 12,000 species belong to the true grasses (Poaceae), which are economically the most important family of monocotyledons.

41. As part of the section 32 reporting, Wildlands examined the extent of ephemeral wetlands in Otago<sup>8</sup>. They noted that ephemeral wetlands were poorly mapped in existing layers such as LCDB and FENZ, as they generally occur at much smaller areas than the minimum mapping units of these classifications. However, ephemeral wetlands were in most cases easily distinguished in aerial imagery and were mapped by hand digitisation across all parts of Otago where ephemeral wetlands occur.
42. Wildlands reported that almost 3,000 ephemeral wetlands were ultimately mapped. Very shallow ephemeral wetlands, and other ephemeral wetlands where the wetland boundaries are not sharply delineated, would be less easy to distinguish and are not likely to have been mapped.
43. It is appropriate to include specific mention of ephemeral wetlands in LF-FW-O9 because of: the size and the place in the landscape that ephemeral wetlands occupy in Otago; the complexities of the matrix of exotic and indigenous vegetation and the fact that not all ephemeral wetlands provide habitats for threatened species (including those restricted to this habitat); and because the current NPS FM definition would not provide for adequate recognition for all ephemeral wetlands in Otago.

#### **Delineation of FMU's**

44. LF-VM-P5 seeks to define the Freshwater Management Units (FMU) within the RPS. The RPS includes five FMU's.
45. The s 42 A report<sup>9</sup> (para 1174-1176) discusses, with some examples, the current mapping of the coastal boundary of the FMU's and notes some inconsistencies which have occurred.
46. Clause 1.5 of the NPSFM<sup>10</sup> states that:
 

[The NPSFM] applies to all freshwater (including groundwater) and, to the extent they are **affected** by freshwater, to **receiving** environments (which may include estuaries and the wider coastal marine area) (emphasis added).
47. There is a clear expectation that the coastal water bodies and coastal water are to be included within Freshwater Management Units to the extent that they are 'affected' by freshwater. This approach reflects a clear emphasis on integrated management, ki uta ki tai, and a holistic approach to managing freshwater.
48. In my substantive evidence for the PORPS<sup>11</sup> (at paragraphs 127-135), I discuss the desirability of integrated management.
49. The physical process of a river or stream discharging into the sea is one of dilution as a mass of freshwater (with associated sediments) is mixed, diluted, and then eventually

<sup>8</sup> Mapping of potential natural ecosystems and current ecosystems in Otago Region Contract Report No. 5015a July 2020. Wildlands Dunedin

<sup>9</sup> <https://www.orc.govt.nz/media/14435/fpi-s42a-report.pdf>

<sup>10</sup> <https://environment.govt.nz/assets/publications/National-Policy-Statement-for-Freshwater-Management-2020.pdf>

<sup>11</sup> <https://www.orc.govt.nz/media/13252/director-general-of-conservation-bruce-mckinlay.pdf>



overwhelmed by the much larger mass of salt water in the oceans. Physically measuring how far the receiving coastal waters are 'affected by freshwater' is and difficult to achieve as this is a dynamic process. The ecological process of a river or stream discharging into the sea is complex and subtle depending on where in the process one choses to sample.

50. Plant and animal communities arrange themselves to take advantage of this mixing process and in the case of animals, to prey on animals and plants in these ecosystems that sustain them. A measure of how receiving environments are affected by freshwater (the extent of 'affect of freshwater') is the community of plants and animals present at any given location along this continuum. Again, it is subtle and complex.
51. In his substantive evidence, my colleague Dr Hendrik Schultz<sup>12</sup> described the indigenous ecosystems and vegetation types present in the Otago Coast. I summarise the types relevant to this context.

| <b>Indigenous ecosystems and vegetation types</b>   | <b>Pressures</b>  | <b>Significance</b>   |
|---|---|---|
| Estuarine and lagoon habitats                       | Sedimentation, contaminants, eutrophication, sea level rise, invasive weeds / fauna                                 | Support saltmarsh vegetation, seagrass, shellfish beds and aquatic bird life; nursery habitat for fish; special significance for wading birds and galaxiid breeding; lagoons are classified as Endangered by the International Union for Conservation of Nature (IUCN), estuaries are classified as Vulnerable (Holdaway et al. 2012) |
| Saltmarsh   | Coastal development, drainage, pollution, invasive vegetation   | One of the most productive habitat types on earth, carbon dioxide sink, nursery area for fish, important breeding/feeding habitat for birds; significant reduction in extent and quality  |
| Seagrass beds (eelgrass / <i>Zostera muelleri</i> ) | Physical damage by human activities, water quality, sedimentation, introduced species, disease, increased turbidity | Indigenous only to New Zealand and southern Australia, high primary productivity; sediment retention, provisioning of habitat, sink for land derived nutrients; nursery areas for fish, seagrass in New Zealand likely experienced extensive declines in late 19th and early 20th centuries, with evidence for recovery in some areas |

<sup>12</sup> <https://www.orc.govt.nz/media/13255/director-general-of-conservation-hendrik-schultz.pdf>

|                 |   |   |
|-----------------|---|---|
| Macroalgae beds | Sedimentation, increased sea temperatures | Important habitat for many marine species, provide ecosystem services such as carbon storage and nutrient cycling |
|-----------------|---|---|

52. The indigenous ecosystems and vegetation types detailed above are all 'affected by freshwater'. How they occupy space is a complex result of the matrix of geological substrates, geomorphological process, freshwater quality, and freshwater quantity. These habitats should be mapped as included in Freshwater Management Units.
53. Examples of where this change is required to ensure appropriate definition and delineation of the FMU include Hoopers Inlet, Blueskin Bay and Otago Harbour. Otago Harbour should be mapped as within the Dunedin and Coast FMU as it has several freshwater streams discharging into it such as the Water of Leith, Thomson Creek (Sawyers Bay), Abernethys Creek (Waipuna Bay), and Baynes Creek (Company Bay). Additionally, Otago Harbour contains intact and healthy examples of Seagrass beds, Saltmarsh and estuarine habitats. In addition, the Harbour supports a comprehensive aquatic bird community with some 76 species being recorded in structured surveys between 1977-2010<sup>13</sup>.
54. A second issue with respect to the delineation of FMU's relates to the Puerua River, near Balclutha. The issues relating to the correct FMU to assign this river to are discussed in the s42A report (paras 1191-1197). The Puerua River in its lower reaches flows across and drains the southern flood plain of the Matau Branch of the Mata-au River. This is a more relevant ecological and hydrological context to consider this river in than the Catlins FMU, which is a collection of smaller catchments south of the Clutha/Matau-au FMU.

### Dryland context

55. In Otago, water deficits and the dryland nature of the landscape underpin much of the Significant Resource Management Issues identified in the RPS as notified. Specifically, SRMR-I5 states:
- “Freshwater demand exceeds capacity in some places”.
56. The impact of water deficits and the dryland nature of the landscape is also relevant to SRMR-I2 (Climate Change), SRMR-I7 (Biodiversity Loss), SRMR-I10 (Economic Growth). The dryland nature of Otago is particularly relevant to the: North Otago FMU, Taiari FMU, Manuherekia Rohe, Dunstan Rohe, Roxburgh Rohe (All Clutha Mata-Au FMU). It will also be relevant to the Dunedin and Coast FMU if a proposal to include the Waikouaiti Catchment in this FMU is agreed to. Consequently, the dryland context in which land and water management occurs in Otago is a region wide matter for consideration.

<sup>13</sup> See McKinlay 2011 Change in pattern of bird numbers and usage on Otago Harbour 1977-2010. Abstract at: <https://www.birdsnz.org.nz/wp-content/uploads/2019/01/2011-Abstracts.pdf> Full presentation available.

57. In my substantive evidence dated 23 November 2022<sup>14</sup>, I have discussed this context (paras 35-62) in terms of the Section 32 reporting to the ORC which describes the values present in Otago. I highlighted (para 54) the importance of recognising the dryland ecosystems and habitats in Otago. At this time, I said:

“With respect to the dryland ecosystems and habitats in Otago I add that drylands:

- Are much reduced in extent,
- Suffer ongoing loss and fragmentation (incl. irrigation, cultivation and residential/lifestyle block development),
- Support a rich diversity of plants and animals,
- Support a disproportionately high number of threatened and rare species (especially plants),
- Are generally a threatened LENZ category,
- Have several naturally rare ecosystems.

58. This remains the case and justifies explicit recognition in the FPI of the fact that water and land management need to recognise the dryland nature of much of Otago. This will provide important context when making resource decisions.

### **Wetland Complexes in the Clutha Mata-Au FMU.**

59. Wetlands can be small and simple, and as they increase in size the complexity of ecological values, expressed as a range of vegetation types, the numbers and types of wildlife species, increases. As noted in the s 42A Report, the complexity and range of habitats present in the Waipōuri/Waihola wetland and Upper Taiari wetland complex justify specific mention in the RPS<sup>15</sup>. The importance of these wetlands in the region is already recognised in the Regional Water Plan as Regionally Significant Wetlands and Wetland Management Areas<sup>16</sup>.

60. Lake Tuakitoto is a similarly large and complex site. Nine significant vegetation zones, from open water communities through to willow forest, were mapped in a 1987 report (McKinlay 1987)<sup>17</sup>. Additionally, Lake Tuakitoto is recognised as one of two large lake systems in the South Island, with all common waterfowl and with significant populations of NZ Shoveler and SI fernbird (McKinlay 1987). Overall, 31 wetland bird species have been recorded at Lake Tuakitoto which compares favourably with 27 wetland bird species recorded in the Upper Taiari Wetland complex. Based on the complexity and values present, Lake Tuakitoto is comparable to the Waipōuri/Waihola wetland Upper

<sup>14</sup> <https://www.orc.govt.nz/media/13252/director-general-of-conservation-bruce-mckinlay.pdf>

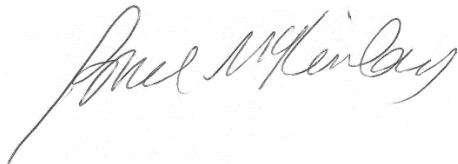
<sup>15</sup> Para 1120 Section 42 A report.

<sup>16</sup> Schedule 9: Regional Water Plan [https://www.orc.govt.nz/media/12844/regional-plan\\_water-for-otago-updated-to-3-september-2022-schedules-etc.pdf](https://www.orc.govt.nz/media/12844/regional-plan_water-for-otago-updated-to-3-september-2022-schedules-etc.pdf)

<sup>17</sup> DOC-2877470

Taiari wetland complex and should be recognised as such in the Regional Policy Statement.

61. In my opinion, the situation with large multi-habitat wetland complexes is repeated in the Upper Lakes Rohe of the Clutha Mata-Au FMU. The braided river systems (e.g., Dart/Rees Braided River<sup>18</sup>, Matukituku Braided River<sup>19</sup>, Makarora Braided River<sup>20</sup>, Hunter Braided River) and the lakes these large rivers flow into, provide a diversity and a complexity of terrestrial and aquatic habitats subject to dramatic change through floods.
62. The policy outcomes relevant at these sites may vary but in order to be consistent and to promote a Region wide approach to the restoration and maintenance of large complex wetlands, all of these are worthy of explicit mention in the RPS.




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**Bruce McKinlay**

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Mace, G. M., et al. (2008). "Quantification of Extinction Risk: IUCN's System for Classifying Threatened Species." Conservation Biology **22**(6): 1424-1442.

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<sup>18</sup> Parts of which are recognised as a Regionally significant wetland.

<sup>19</sup> Parts of which are recognised as a Regionally significant wetland.

<sup>20</sup> Parts of which are recognised as a Regionally significant wetland.

Townsend, A. J., et al. (2007). New Zealand Threat Classification System manual. Wellington, Department of Conservation: 35.