BEFORE THE ENVIRONMENT COURT
I MUA I TE KOOTI TAIAO O AOTEAROA

AT CHRISTCHURCH	**ENV-2018-CHC-29, 37, 39, 40, 47, 50**
IN THE MATTER	of the Resource Management Act 1991
AND	of an appeal under clause 14 of the First Schedule of the Act
BETWEEN	**Aratiatia Livestock Limited** (ENV-2016-CHC-29) Appellant [Continued on next page]
AND	**Southland Regional Council** Respondent

EVIDENCE IN CHIEF OF BRIAN DAVID RANCE
FOR DIRECTOR-GENERAL OF CONSERVATION
AS A SECTION 274 PARTY IN SUPPORT (Topic A Hearing)
Dated 1 March 2019

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Planning, Permissions and Land
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BETWEEN

Wilkins Farming Co. Limited
Appellant
(ENV-2016-CHC-30)

Southland Fish and Game Council
(ENV-2016-CHC-37)

Meridian Energy Limited
(ENV-2016-CHC-38)

Alliance Group Limited
(ENV-2016-CHC-39)

Federated Farmers of New Zealand
(ENV-2016-CHC-40)

Te Rūnanga o Ngāi Tahu and Others
(ENV-2016-CHC-47)

Royal Forest and Bird Protection Society of New Zealand Inc.
(ENV-2016-CHC-50)
Appellants

AND

Southland Regional Council
Respondent

Introduction

1. My full name is Brian David Rance.

2. My qualifications are a Bachelor of Science (Hons) from the University of Otago awarded in 1984.

3. I am employed by the Department of Conservation (DOC) in the Invercargill Office as a Technical Advisor – Ecology. I have worked for DOC since its inception in April 1987. Before this I worked for the Lands and Survey Department and the University of Otago. My role involves terrestrial ecosystems, native flora and threatened species assessment and management with a particular focus on the DOC's Southern South Island Region. I am responsible for providing advice in relation to the management, conservation and restoration of ecosystems and threatened species.

4. I have an extensive knowledge of the biodiversity, geography, landforms and biogeography of Southland. This knowledge has been built up from field work throughout Southland over many years in both a professional and recreational capacity. I have worked with ecosystems from the coast to mountain tops, including wetland ecosystems. I have had extensive experience with assessing ecological values in Southland. For example, I have been involved in three Protected Natural Area Programme (PNAP) surveys in Southland (i.e. Umbrella, Taringatura, Southland Plains Ecological Districts). I have also undertaken a substantial number of botanical/ecological assessments for a wide range of activities and proposed developments both on Public Conservation Lands and private land, throughout Southland. Many of these assessments have partially or fully involved wetlands.

5. I have often been requested to provide ecological information and ecological assessments for several agencies in Southland including for Invercargill City Council (ICC), Southland District Council, Southland Regional Council, Landcare Trust, Queen Elizabeth II National Trust, community groups as well as private landowners. I have been a member of the Biodiversity Southland forum since its inception. I have previously served on the New Zealand threat assessment panel for indigenous vascular plants.

6. I have been recognised for my services to ecology and the environment by being awarded the Loder Cup and a Queens Service Medal.

7. I have extensive experience in assessing the pressures on wetlands in the Southland region, in particular in relation to wetland drainage, habitat loss, fire and invasive species. Most recently, my technical role included the ground-truthing of remote sensing data relating to wetland loss in Southland.

8. I am a co-author on some scientific publications involving wetlands, including:

Clarkson B, Briggs C, Fitzgerald N, Rance B and Ogilvie H. (2011). Current and historic wetlands of Southland Region: Stage 2. Landcare Research Report LC312 (for Environment Southland), Hamilton, New Zealand.

Richardson S J, Clayton R, Rance B. D, Broadbent H, McGlone M S and Wilmshurst J M. (2015) Small wetlands are critical for safeguarding rare and threatened plant species. Applied Vegetation Science 18:230-241.

Robertson H. A, Ausseil A-G, Rance B, Betts H and Pomeroy E. (2018) Loss of wetlands in Southland, New Zealand. New Zealand Journal of Ecology 43(1): 3355.

9. While I am employed by the Department of Conservation, and the Department has an advocacy function under the Conservation Act 1987, my role in preparing and giving this evidence is as an independent expert. In my role with the Department it is expected that I will provide advice in accordance with recognised standards of integrity and professional competence.

10. As well as having a duty to the Court (and I note below that I agree to abide by the Environment Court's Code of Conduct for Expert Witnesses), I also have a duty to be independent as an expert ecologist. It has been explained to me that, in providing evidence, I am authorised to provide any evidence that is within my expertise which goes outside the Department's advocacy function.

Code of Conduct

11. I confirm that I have read the code of conduct for expert witnesses as contained in section 7.1 of the Environment Court's Practice Note 2014. I have complied with the practice note when preparing my written statement of evidence and will do so when I give oral evidence before the Court.

12. 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.

13. 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.

Scope

14. I have been asked to provide ecological evidence in relation to following topics:

    a) The ecological importance of wetlands in Southland
    b) Wetlands of regional importance in Southland
    c) An overview of wetlands in the Waituna Lagoon catchment
    d) Threats to wetlands in Southland
    e) Overview of continuing wetland loss in Southland
    f) Comment on Respondent's/Appellant's evidence

15. The key documents I have used while preparing my evidence.

    a) The proposed SWLP
    b) S42A report
    c) National Policy Statement for Freshwater Management 2014 (amended 2017); and
    d) The reports listed in the Reference List of this evidence.

16. In preparing my evidence I have reviewed the evidence of Dr Kelvin Lloyd (for Environment Southland) and the evidence of Kate McArthur (for Forest and Bird).

Executive Summary

17. The Southland Region has a wide range of wetland types. These wetlands support a diverse flora and fauna, including several 'Threatened' and 'At Risk' species.

18. The Southland Region contains many wetlands that are considered to be of international, national and regional importance.

19. Southland wetlands face a range of threats, including conversion to other land use, drainage and modification of hydrological function, grazing, peat mining, harvest of species (including sphagnum moss), changes to nutrient status,

burning, weed invasion and pest animals. All of these threats are currently occurring to some degree in Southland.

20. Wetland loss due to the conversion of wetlands to other land use is one of the critical pressures on wetlands in Southland. There has been a large amount of historic loss with only about 10% of the original extent of Southland wetlands remaining. This extent of wetland loss is similar to overall wetland loss for all of New Zealand as a whole.

21. Wetland loss is continuing in Southland. For example, in one recent Southland study the loss, or increase in risk of loss, in the period 1990 to 2012 was estimated to be 23% of the remaining wetlands in the study area. (i.e. 7,395 ha) (Robertson et al, 2018).

The ecological importance of wetlands in Southland

22. Southland is an ecologically diverse area. The original ecosystems present were dominated by a range of forest types including beech, podocarp, hardwood and mixes of these below treeline, and snow tussockland above the treeline. Other original ecosystems include, wetlands, shrublands, herbfields, beaches/dune systems, estuaries/saltmarsh, riverbeds, rock/stonefield/ cliffs/ bluffs and others. All of these ecosystems still remain in Southland. These ecosystems provide habitats for a wide range of flora and fauna, including many threatened species and species endemic to Southland.

23. Lowlands and coastal ecosystems have undergone the greatest amount of loss, fragmentation and other modification. Hill country and inland areas have also undergone extensive loss and modification. Mountain lands have undergone a lesser degree of modification.

24. Wetlands are a characteristic feature of the ecology of Southland, being widespread and occurring from the coast to the highest mountains Figure 1 shows the extent of wetlands in Southland.

25. Southland contains a rich diversity of wetland types. The book ‘Wetland types in New Zealand’ (Johnson & Gerbeaux, 2004) identifies 9 major wetland classes in New Zealand. Eight wetland classes are found in Southland, these being: bog, fen, swamp, marsh, seepage, shallow water, ephemeral wetland and saltmarsh. Only the pakahi and gumland wetland class is not present.

26. Singers and Rogers (2014) have developed a national ecosystem classification system. This classification system includes 22 wetland types found in New Zealand. 16 of these types are found in Southland (see attachment 1). Photographic examples of some of these wetlands ecosystems are provided in attachment 2. I consider that some of the best national examples of some of these types are found in Southland, such as Awarua Plains/ Waituna Wetlands (including Waituna Lagoon), Freshwater Valley, Kepler Mire, Nokomai String bog, Back Valley wetlands, Mt Hamilton Flats and the margins of Lakes Manapouri and Te Anau.

27. Several wetland ecosystems are considered to be historically or naturally rare ecosystems (Williams et al, 2007). The historically rare ecosystems include lake margins, cushion bogs, ephemeral wetlands, dune slacks, string mires, blanket mires, tarns, estuaries, lagoons, seepages/flushes and snow banks, which are all found in Southland.

28. Protecting our Places' (MfE, 2007) provides four National Priorities for biodiversity protection. Two of these are:

> National Priority 2: To protect indigenous vegetation associated with sand dunes and wetland; ecosystem types that have become uncommon due to human activity.
>
> National Priority 3: To protect indigenous vegetation associated with 'originally rare' terrestrial ecosystem types not already covered by priorities 1 and 2.

29. The threat status of New Zealand's historically rare ecosystems has been assessed (Holdaway et al, 2012). Ephemeral wetlands are assessed as Critically Endangered, dune slacks, lagoons, braided river beds and seepages/flushes are assessed as Endangered, while lake margins and blanket mire and estuaries are assessed as Vulnerable.[1]

30. Wetlands support a diverse, characteristic and often specialist flora and fauna. Southland wetlands support many threatened species including invertebrate, lizard, bird and plant species. Some wetlands contain an abundance of threatened species. For example, the fluctuating margins of Lakes Manapouri and Te Anau support at least 33 'Threatened' and 'At Risk' plant species (de

[1] Holdaway (2012) follows International Union for Conservation of Nature red list threat criteria for ecosystems to assign a threat status of Critically Endangered, Endangered, Vulnerable and Not Threatened

Lange et.al, 2018). This is one of the most diverse habitats for threatened plants in Southland.[2]

31. Southland wetlands are a national stronghold for some plant species including tufted hair grass *Deschampsia cespitosa* (threat status: At Risk - Declining) on the shores of Lakes Manapouri and Te Anau; the sedge *Carex tenuiculmis* (threat status: At Risk - Declining) in the Te Anau basin; and *C. littorosa* (threat status: At Risk - Declining) on the shores of New River and Fortrose estuaries; and the buttercup *Ranunculus ternatifolius* (threat status: At Risk – Declining) in the Grebe Valley.

32. Southland wetlands also support some plant species which are endemic to (only found in) Southland. Examples being the daisy *Brachyscome linearis* (threat status: Threatened - Nationally Critical), the bittercress *Cardamine lacaustris* (threat status: At Risk – Naturally Uncommon) and the buttercup *Ranunculus ranceorum* (threat status: At Risk – Naturally Uncommon). These species are all found in turf on the margins of lakes and tarns.

33. Wetlands in the Southland Region provide habitat for a number of native fauna species. These include several water fowl, wading birds and other bird species. These wetlands also provide habitat for lizards, freshwater fish and invertebrates some of which are specialised wetland species. Threatened species found in Southland wetlands include Australasian bittern (*Botaurus poiciloptilus*; threat status – Nationally Critical), South Island fernbird (*Bowdleria punctata* ssp. *punctata*; threat status: At Risk – Declining), marsh crake (*Porzana pusilla* ssp. *affinus*; threat status: At Risk – Declining) and Spotless crake (*Porzana tabuensis* ssp. *tabensis*, threat status: At Risk – Declining).

34. Landcare Research were commissioned by Environment Southland to map the current and historic extent of wetlands found in Southland, excluding wetlands administered by Department of Conservation in Fiordland National Park and Stewart Island (Clarkson et. al, 2011, unpublished report). This study provided the extent of the major wetland classes found in Southland. They found that the extent of wetlands (outside Fiordland NP and Stewart Island) was 27,814 ha, comprising 19,590 ha of bog, 5,855 ha of fen, 2,085 ha of swamp and 284 ha of marsh. A large proportion of this area is comprised of the Awarua Wetland (see paragraph 45 below). The Department of Conservation manages a larger area of wetlands in Southland than any other agency.

[2] Threat status for species are described in the EiC of Ms Funnell, at paragraphs 39 – 40. See also Fig 1 of EiC of Ms McArthur for a useful diagrammatical illustration of the species threat classification system.

35. Despite the reduction of wetland extent since European settlement, Southland remains one of the most important areas in New Zealand for wetlands. This importance is assessed on the basis of a combination of wetland extent, diversity and condition. As at 2008, Southland contained c. 18% of remaining wetlands in New Zealand and was second only to the West Coast (34%) in this respect (Ausseill et al. 2008.

36. Southland has one Ramsar Wetland of International Importance[3], that being the Awarua Wetland, which at c. 19,200ha is the largest Ramsar listed wetland in New Zealand. There are several other wetlands and wetland complexes that strongly meet the Ramsar criteria (Denyer & Robertson 2016). These include the extensive alpine wetland systems on the Garvie Mountains, wetlands in the Te Anau Basin, Freshwater Valley (within Rakiura National Park), wetlands at Borland and the Grebe Valley (Fiordland National Park), Big Bay and the Pyke Valley (northern Fiordland) and potentially others.

37. The Department of Conservation has invested significant resources into the acquisition and protection of wetlands in Southland over the previous 20 or more years. The protection includes 5 areas adjoining the Awarua Ramsar Wetland (c. 740 ha), most of the Bayswater Bog (c. 520 ha), much of the Castle Downs Wetland (c. 640 ha), wetlands adjacent to Fiordland National park at Borland (greater than 100ha), and at other sites.

38. The department has developed management prescriptions for many wetlands in Southland including these of highest importance. The greatest management needs for these wetlands are maintenance of fences (where appropriate) to prevent stock access, weed control and advocacy regarding adjacent land use which may impact upon the health of the wetland.

Wetlands of Regional Significance in Southland

39. A key aspect of the pSWLP is the appendix of 'regionally significant wetlands and sensitive waterbodies' (Appendix A of the pSWLP).

[3] Listed under the Ramsar Convention on Wetlands of International Importance. Wetlands are selected for the List on account of their international significance in terms of ecology, botany, zoology, limnology or hydrology and need to meet specified criteria outlined in the Ramsar Convention on Wetlands. New Zealand became a party to the Ramsar Convention on Wetlands on 13 December 1976 and has listed six sites.

40. Southland contains many nationally and regionally significant wetlands, in part because of the extent, diversity and condition of the wetland found in Southland.

41. Many of the wetlands found in Southland should be recognised as of Regional Significance in the pSWLP because of their importance as habitat for indigenous flora and fauna, including threatened species.

An overview of wetlands in the Waituna Lagoon Catchment

42. The Waituna Lagoon Catchment lies on the Awarua Plains adjacent to the southern Southland coast.

43. One feature of the Waituna catchment are the remaining areas of indigenous vegetation. These remnants include forest stand, wetlands and gravel beaches.

44. Another feature of the Waituna Lagoon catchment is the abundance of peat soils within the catchment (especially in the southern portion of the catchment) and the wider Awarua Plains area.

45. Some (but not all) of the remaining wetlands within the Waituna Lagoon catchment are within the Awarua Wetland Ramsar Wetland of International Importance. The Awarua Wetland Ramsar Wetland includes the Waituna Scientific Reserve (including the Waituna Lagoon), the Seaward Moss Conservation Area, the Toetoes Conservation Area and other parcels of protected wetland. Attachment 3 provides photographs of the vegetation within the Awarua Ramsar Wetland.

46. The wetlands present within the Waituna Lagoon Catchment include parts of the extensive peat bog occurring on the Awarua Plains. However, a range of other wetland ecosystems are also present. In total 12 of the 16 wetland ecosystems recognised by Singers & Roger (2014) found in Southland are present.

47. Waituna Lagoon is a predominantly freshwater system that is periodically opened to the sea and becomes tidal when open. The lagoon supports a relatively intact aquatic plant community dominated by Ruppia spp. The lagoon margins are dominated by a oioi (*Apodasmia similis*) restiad rushland community.

48. Waituna Lagoon is one of the best examples of an intermittently open and closed lagoon in New Zealand (Department of Conservation, 2018). The lagoon has also been classified as a “Waituna” type lagoon (Hume, 2016)

49. The Waituna Lagoon and its margins support several threatened species including regionally or nationally important populations of horse’s mane weed (*Ruppia megacarpa*; threat status: At Risk – Naturally Uncommon), tufted hair grass and swamp nettle (*Urtica perconfusa*), both with the threat status of At Risk - Declining).

Threats to wetlands in Southland

50. The threats to the wetlands of Southland are many and varied (Campbell et al, 2003). These threats include wetland direct human impacts such as land development, drainage, stock grazing, peat mining and sphagnum moss harvesting. Other impacts include fire, weed encroachment, pest animal impacts and changes in nutrient status.

51. Land development is generally for establishment of pasture, however there are also examples of wetland drainage for forestry and horticultural use (notably blue berry cropping). For example, Attachment 4 illustrates land development of a wetland.

52. Drainage of wetlands results in hydrological change and a consequent affect upon the ecological function of a wetland. Drainage will change the water table and hydrological regime of the wetland, which can result in the change in indigenous wetland plant composition. Drainage can also facilitate the invasion of weeds and other exotic species, through the site disturbance, introduction of weeds on machinery and through a change in hydrological function which allows weed species to prosper. Drainage can result in the decomposition of peat soils. Often drainage is the first stage of land use change, intensification of land use or land development and so may result in further future modification or wetland loss. Attachment 5 illustrates examples of drainage within wetlands.

53. Many of the remnant floodplain forests and wetlands of lowland Southland have been impacted by hydrological change and associated impacts as a result of widespread drainage, stream deepening, floodbanks, retention dams and other human infrastructure.

54. Wetlands types generally have a specific nutrient composition and range limits. The flora present within a wetland is adapted to a specific nutrient regime. Therefore, a change in the nutrient status may result in a change to the plant community, including allowing weeds and other exotic species to establish and prosper. An addition of nutrients can occur through fertility drift, through changes in nutrient status of waters entering the wetland and through a change of land use including grazing of the wetland.

55. Weeds which can adversely impact on wetlands in Southland include woody species such as gorse, Spanish heath, silver birch, grey willow, holly, rowan, and Scotch heather. These species can overtop the indigenous vegetation and so significantly alter the ecosystem values. However, lower stature exotic species such as white clover, birdsfoot trefoil, grasses (e.g. Yorkshire fog, marsh foxtail and sweet vernal) and rush species (e.g. jointed rush, heath rush and soft rush) can all become common and impact upon the ecological values of wetlands. Weed species impact wetlands from the coast to high in the mountains.

56. These threats are all still actively reducing the ecological health and natural character of many Southland wetlands.

Overview of continuing wetland loss in Southland

57. Ausseil et. al. (2008) estimated that the original (c. 1850) extent of wetlands in Southland was 450,00ha.

58. The Landcare Research project (Clarkson et. al, 2011, unpublished report) that mapped the current and historic extent of wetlands found in Southland (outside of Fiordland and Stewart Island), found that there had been a major loss of wetland extent. For bog 64% of the original (i.e. 1840) extent remained, for fen 13% remained, for marsh 4% remained and for swamp 1% remained. Overall c. 10% of wetlands remains, a similar amount of loss as for New Zealand nationally (Ausseil et al. 2008).

59. A study in which I was a co-author (Robertson et al, 2018) examined wetland loss in Southland between c. 1990 and c. 2012. The study compared three sub regions – Southland Plains, Inland Southland and Te Anau Basin. A total of 32,814ha of wetlands was present in the Southland study area in 1990. Of this

extent 24,854 ha (76% were on the Southland Plains, with Te Anau basin having 3,411 ha (10%) and Inland Southland having 4,549 ha (14%).

60. A total loss of 3449 ha was identified between 1990 and 2012, the greatest loss on the Southland Plains (3223 ha), including extensive loss on the Awarua Plains. During the 22-year study period the average wetland loss was 157 ha per annum, or 0.5%. A further 3,943ha were classified as 'at risk', due to the presence of drains and degradation of vegetation.

61. Wetland loss was found to occur to small (<5 ha), medium (5-50 ha) and large (>50 ha) wetlands. The proportion of wetland lost or at risk of loss in the Southland Plains was similar across all wetland sizes, except for the 50-100 ha wetlands that had a much higher proportion of area affected by land conversion.

62. The Landcover Database mapping indicated that conversion to agricultural and horticultural land uses, particularly high and low producing grassland, accounted for over 60% of the wetland loss.

63. This research found that there has been a substantial loss in wetland extent, which when combined with the 'at-risk' wetlands shows there was a 23% reduction of wetlands in Southland over the study period. The consideration of 'at-risk' wetlands is important as the at-risk wetlands have been identified by drainage works or other modification. This drainage or other modification may be a precursor to further modification, land use change or development. Most of the wetland loss (c. 97%) occurred on private land.

64. The rate of wetland loss found in this study (i.e. 0.5% per year) increased to 1% per year if the 'at-risk' wetlands are included. This rate of loss is similar to the historic (c. 1850-2003) of 0.8% per year for Southland. Therefore, contrary to popular opinion or perception, the rates of wetland loss in recent years has not significantly reduced.

65. A study by Richard Ewans (Ewans, 2016) considered wetland loss in non-public conservation land between 2007 and 2014. This study found a total loss of 809 ha of wetlands in Southland. This loss is approximately 10% of the wetland area not in public conservation lands, which equates to a loss of 1.5% year, with 23% of wetland polygons either reduced in size or lost.

66. The paper by Robertson and others found that the amount of wetland loss is at an average rate of 167 ha per year. The Ewans study indicated the more recent

loss (i.e. 2007-2014) is in the order of 176 ha per year. This research suggests that the rate of wetland loss is not declining.

67. Wetland development and conversion to pasture generally requires drainage and clearance of vegetation. Under the RMA and associated local authority planning rules, land use consents are generally required by landowners to undertake wetland drainage and clearance of indigenous vegetation. Despite these planning regulations wetland development appears to be increasing or potentially increasing within Southland.

Comment on Respondent's/Appellant's evidence

68. I have read the statement of evidence of Dr Kelvin Lloyd. I am in strong agreement with this evidence. This evidence discusses the current state of wetlands in New Zealand, the current state of wetlands in Southland, the importance of wetlands in Southland and recent trends (i.e. declines in the extent of wetlands). I am in agreement with Dr Lloyd on these topics.

69. Dr Lloyd uses some examples of the importance of wetlands as habitat for threatened avifauna. Southland wetlands can be considered equally important for their regionally and nationally significant flora values. Southland wetlands also have importance as habitat for threatened lizards and invertebrates.

70. While Dr Lloyd's evidence makes some reference to the ecological diversity of Southland in my view it does not adequately describe that diversity or discuss the naturally rare wetland types that are present.

Comment on the evidence Kate McArthur for Forest and Bird Protection Society

71. I have read the statement of evidence of Kate McArthur. I am in agreement with the evidence relating to Waituna Lagoon, particularly regarding Policy 46 on pages 33 and 34 of her evidence.

Conclusion

72. The Southland Region contains significant wetlands. Wetland loss in Southland is continuing, and studies indicate it is not declining. There is a need to ensure

that activities which adversely impact upon the wetland resource of the Southland region avoid future modification or loss of wetlands.

Brian Rance

1 March 2019

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Figure 1 Map of Southland Wetlands

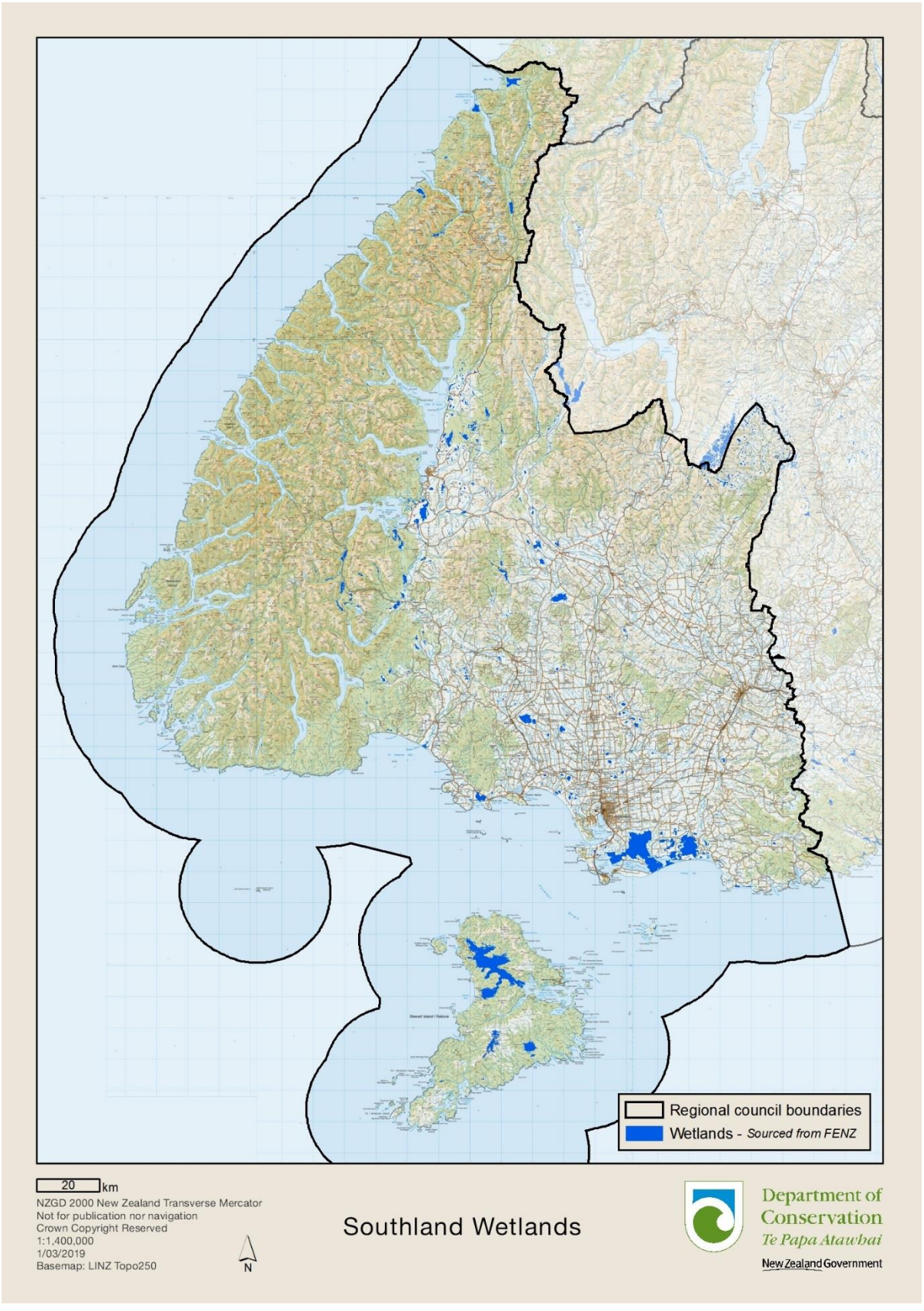
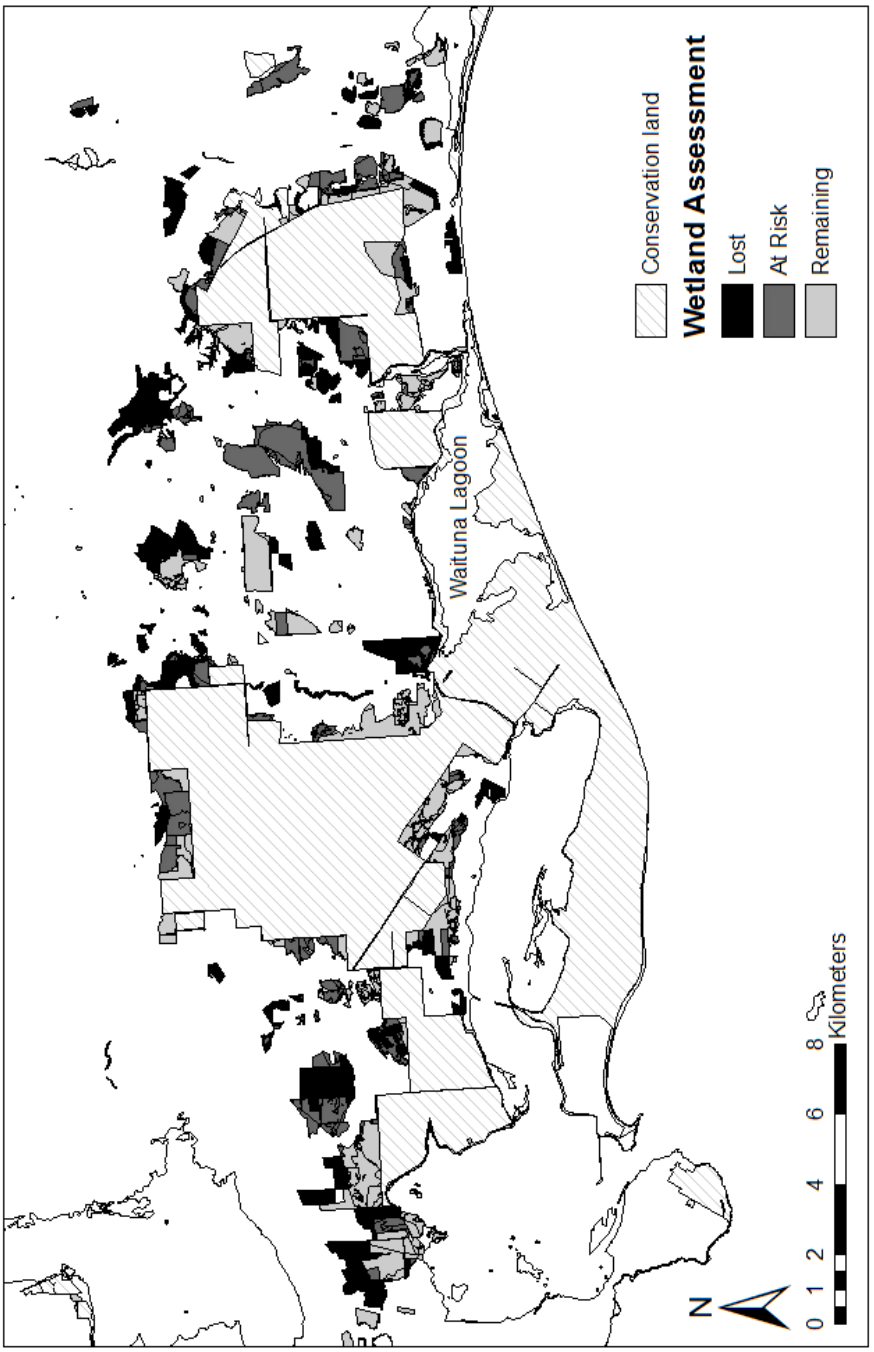


Figure 2 Map of Wetlands and wetland loss on the Awarua Plains



Attachment 1 Wetland Ecosystems found within Southland and the Waituna Lagoon Catchment

Wetland Ecosystem code	Wet Ecosystem name	Extent within Southland (L = Limited; M = Moderate; Ma – Major)	Extent within Waituna Southland (L = Limited; M = Moderate; Ma – Major)
WL6	Lesser wire rush, tangle fern restiad rushland/ fernland	Ma	Ma
WL7	Tall tussock tussockland	M	-
WL8	Herbfield/mossland/sedgeland	L	L
WL9	Cushionfield	M	L
WL10	Oioi restiad rushland/reedland	M	M
WL11	Macherina sedgeland	M	L
WL12	Manuka, tangle fern scrub/fernland	L	Ma
WL13	Sphagnum mossfield	L	L
WL14	Herbfield [ephemeral wetland]	L	L
WL15	Herbfield [Lakeshore turf]	L	-
WL16	Red tussock, *Schoenus pauciflorus* tussockland	L	L
WL17	*Schoenus pauciflorus* sedgeland [Alpine seepages/ flushes]	M	-
WL18	Flaxland	L	L
WL19	Raupo reedland	L	L
WL20	*Coprosma* twiggy tree daisy scrub	L	-
WL22	*Carex*, *Schoenus pauciflorus* sedgeland	M	L

Attachment 2 Photos of wetland ecosystems in Southland

Bog Type wetland (of Johnson & Gerbeaux)

Ameoboid Mire, Kepler Track – Lesser wire rush, tangle fern restiad rushland/fernland (=WL6) Ecosystem type (see attachment 1)

Borland Mire Scientific Reserve - Lesser wire rush, tangle fern restiad rushland/fernland (=WL6) with interspersed Sphagnum wetland (WL13) Ecosystem type (see attachment 1)

Castle Downs wetland - Lesser wire rush, tangle fern restiad rushland/fernland (=WL6) Ecosystem type (see attachment 1)

Waituna Wetland - Lesser wire rush, tangle fern restiad rushland/fernland (=WL6) Ecosystem type (see attachment 1)

Upland alpine bog

Key Summit (moss bog and cushion bog) – Herbfield/mossland/sedgeland (WL8) with associated cushionbog (WL9) Ecosystem types (see attachment 1)

Blue Mountains summit - Sphagnum wetland (WL13) and Red tussock, *Schoenus pauciflorus* tussockland (WL16) Ecosystem types (see attachment 1)

Volley Valley (Mt Nicholas Stn) - Herbfield/mossland/sedgeland (WL8) (stringbog form) Ecosystem types (see attachment 1)

Remarkable Mountains - *Schoenus pauciflorus* sedgeland [Alpine seepage] (WL17) Ecosystem type (see attachment 1)
Fen Type wetland (of Johnson & Gerbeaux)

Mt Hamilton Flats – Red tussock, *Schoenus pauciflorus* tussockland (WL16) Ecosystem type (see attachment 1)

Redcliff wetland – *Carex*, *Schoenus pauciflorus* sedgeland (WL22) Ecosystem type (see attachment 1)

Swamp

Redcliffe wetland – Flaxland (WL18) ecosystem type (see attachment 1)

Estuary

Takahopa Estuary – Oioi rushland reedland (WL10) ecosystem type (see attachment 1)

Ephemeral wetland

Von Valley – Herbfield [Ephemeral wetland](WL14) ecosystem type (see attachment 1)

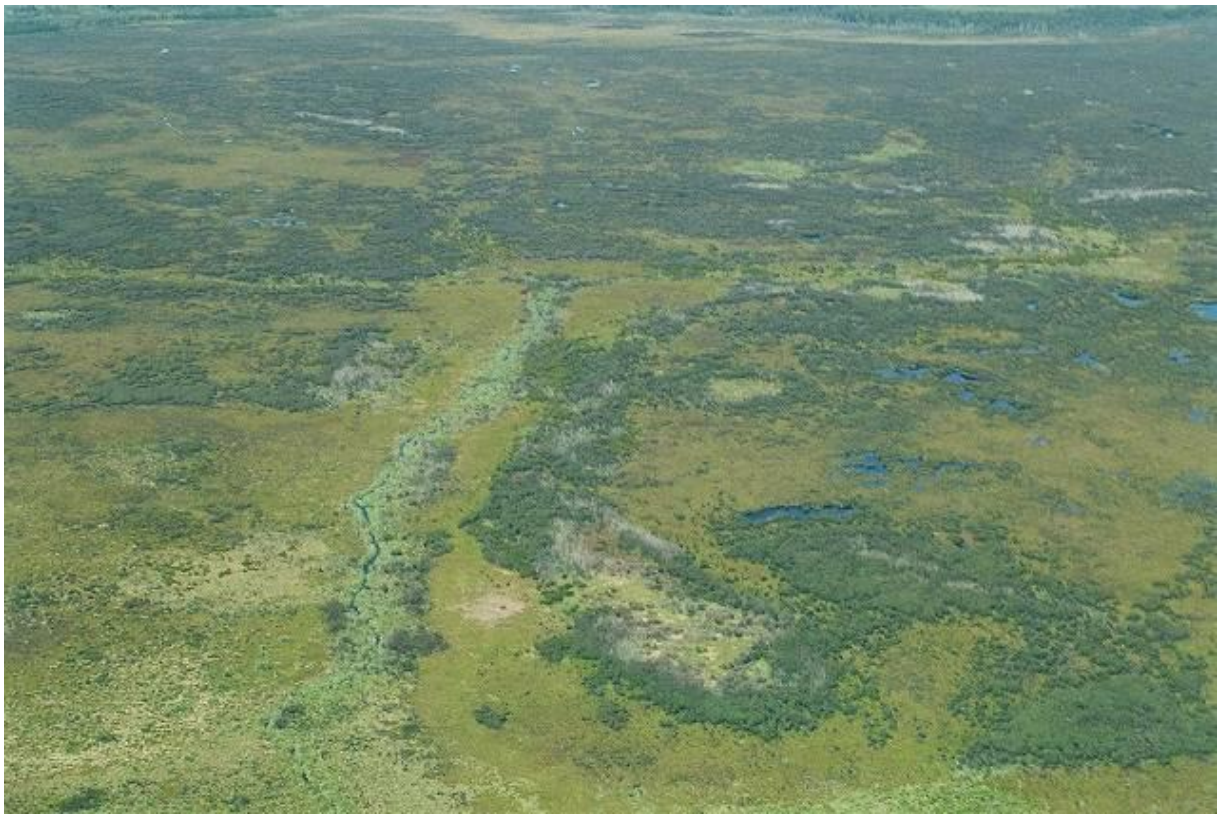
Back Valley, Lake Manapouri – Coprosma, twiggy tree daisyscrub (WL20) ecosytem type (see attachment 1)

Lake margin/lakeshore turf

Lake Manapouri – Herbfield [Lakeshor turf](WL15) ecosytem type (see attachment 1)

Lake Manapouri – Herbfield [Lakeshor turf](WL15) and Oioi rushland reedland (WL10) ecosytem type (see attachment 1)

Attachment 3 Awarua Plains Wetlands



Awarua Ramsar wetland – sequence from fertile flax swamp along watercourse, through fen with red tussock and sedges into extensive wirerush and manuka peat bog.

Awarua Ramsar wetland – sequence from fertile flax swamp along watercourse, through fen with red tussock into extensive wirerush and manuka peat bog.

Awarua Ramsar wetland –extensive wirerush and manuka peat bog, with peat tarns.

Awarua Ramsar wetland – sequence from fertile flax swamp along watercourse, through fen with red tussock and sedges into extensive wirerush and manuka peat bog.

Waituna Lagoon at the mouth of Waituna Stream.

Awarua Ramsar wetland – sequence from forest remnant into extensive wirerush and manuka peat bog.

Attachment 4 Wetland development adjacent to the Awarua Ramsar Wetland of International Importance

Attachment 5 Eamples of drainage within wetlands

Drains within wetlands on the margin of the “Little Waituna Lagoon”

Drainage works on the margin of the Awarua Ramsar Wetland of International Importance