BEFORE THE OTAGO REGIONAL COUNCIL

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 (excluding those parts determined to be a Freshwater Planning Instrument)

Expert Evidence of Bruce McKinlay (Technical Advisor Ecology)
for the Director-General of Conservation Tumuaki Ahurei
Dated 23 November 2022

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Introduction

1. My name is Bruce McKinlay.

2. I am employed as a Technical Advisor Ecology in the Biodiversity 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 22 peer reviewed science articles, 27 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 3 September 2021 on the notified proposed Otago Regional Policy Statement (pORPS) and the further submission dated 12 November 2021.

Code of Conduct

8. Although it is not strictly required at a Council hearing, I confirm that I have read the code of conduct for expert witnesses as contained in the Environment Court Practice Note 2014.

9. I have complied with the practice note 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. In the case of wilding conifers, I have relied on published information including the NZ Wilding Conifer Management Strategy (MPI, 2014).

13. In the case of threatened plants, I consulted with Brian Rance a colleague and recognised botanist. Mr Rance has extensive knowledge of the ecosystems, vegetation & flora of southern NZ including Otago.

14. In the case of the Threatened Environment Classification I have relied on: The Threatened Environment Classification for New Zealand 2012: a guide for users[1] and (Cieraad, Walker, Price, & Barringer, 2015).

Scope

15. I have organised this evidence to reflect the chapter headings used in the Section 42A Reports. Specifically, I will be presenting evidence on:
    a. Introduction and Planning Context
    b. Integrated Management (IM)
    c. Ecosystems and Biodiversity (ECO)

16. Within this structure I have been asked to provide evidence in relation to:
    a. providing an overview of the terrestrial indigenous biodiversity across the region including details on threatened indigenous species in Otago and threatened ecosystems in Otago, and whether they warrant recognition in the pORPS, including dryland environments and wetlands (as these are relevant to the ECO chapter),
    b. the linkages or lack of linkages between the ECO, Coast, and Land and Freshwater chapters.
    c. providing the technical basis and support for the inclusion of the proposed new significance criteria for indigenous biodiversity – updated for the Exposure Draft NPSIB, as the latest expression of national expertise on this matter, and probable Government Policy.

[1] https://www.landcareresearch.co.nz/uploads/public/Discover-Our-Research/Environment/Threatened_Environment_Classification_2012.pdf?vid=3

d. discussing the definition of 'naturally rare' in the terrestrial ecology context, and buffer distances in relation to wilding conifers.

17. I have read the Otago Regional Council's Proposed Otago Regional Policy Statement 2021[2]. I have also retrieved other relevant documents to inform this evidence.

18. In preparing this evidence I have reviewed the Otago Regional Council section 32 Evaluation Report: Consideration of alternatives, benefits and costs[3], and the appendices, particularly 12,13 & 14, and the section 42A reports dated April-May 2022, with various corrections and shading updates to October 2022, and including "supplementary evidence" dated October 2022.

19. An exposure draft of the National Policy Statement for Indigenous Biodiversity (E draft NPSIB) was released in June 2022, seeking submissions which closed on 21 July 2022[4].

20. The E draft NPSIB sets out a framework of criteria for identifying areas that qualify as significant natural areas (Appendix 1) as well as other matters relevant to my evidence. I understand the E draft NPSIB has been developed based on previous extensive public consultation, and input from leading ecological practitioners. I also understand that the overall approach has largely been accepted and the Ministry for the Environment has sought feedback from practitioners, iwi/ Māori, stakeholders and those highly familiar with the E draft NPSIB, to ensure its provisions are workable[5].

21. I have reviewed the E draft NPSIB Appendix 1 criteria (Significance criteria for indigenous biodiversity) as they relate to terrestrial ecology. I support these criteria as they are widely used. and I have adopted them in my evidence where appropriate. Additionally these criteria strongly align with the Department's ecological assessment criteria (Davis, Head, Myers, & Moore, 2016).

22. I am aware that the E draft NPSIB has not been approved and gazetted and does not yet have legal force under the RMA. However, because of the process through which the E draft NPSIB has been developed and based on my review of the criteria within my area of expertise, I consider that the Hearing Panel should consider the criteria relevant

[2] https://www.orc.govt.nz/media/10027/proposed-otago-regional-policy-statement-june-2021.pdf
[3] https://www.orc.govt.nz/media/10030/section-32-report-v61.pdf
[4] https://environment.govt.nz/publications/national-policy-statement-for-indigenous-biodiversity-exposure-draft/
[5] Ministry for the Environment Manatū Mō Te Taiao website: https://consult.environment.govt.nz/biodiversity/npsib-exposure-draft/

to the pORPS 2021, and that pORPS 2021 APP2 should be revised to be implement with the E draft NPSIB.

Executive Summary

23. My opinion is that the Science work commissioned by the ORC to inform the pORPS provides a clear justification that indigenous faunal values are present in Otago and need a clear policy framework in the pORPS to promote the avoidance of adverse activities on these values.

24. Otago Region is a diverse landscape and is the location for unique ecosystems. I have highlighted the Upper Taiari and Inland Saline System in my evidence as they are unique in New Zealand. The Otago Regional Council ('ORC') and Central Otago District Council through their respective planning tools need to ensure that the ecological function of these areas is recognised and provided for in plans and enhanced.

25. I am of the opinion that adopting Appendix 1 (E draft NPSIB) into the Otago Regional Policy statement will reflect best practice and will also give clear guidance as to how the Region should implement the assessment of significant natural areas in Otago.

26. The omission of an analysis of threatened plants in Otago is significant and should be rectified in the RPS.

27. It is my view that having separate chapters for Land and Freshwater and ECO will lead to a failure to promote integrated management of the natural resources of Otago

28. To provide that clarity, I recommend that ECO-O1 be amended to include the following:
    - That there is no worsening of the threat classification of indigenous threatened species in Otago;
    - In the term of the pORPS the threat classification of threatened indigenous species in Otago will be improved
    - Areas of significant indigenous biodiversity will be mapped and protected;
    - Threatened ecosystems will be protected in Otago
    - That there is no further loss of LENZ environments that are threatened or At Risk (i.e. <30% of indigenous cover remains),
    - That there is no further loss of naturally rare ecosystems or ecosystems that have been heavily depleted.

29. In my opinion there are multiple impacts and objectives that are required to be recognised in responding to the adverse effects of wildling conifer and these need consideration in a Regional Policy Statement within a land management context not a biodiversity context.

30. I recommend that a new policy to include outcome statements for Regional Pest Management is inserted into the pORPS.

31. An integrated approach to economic and environmental activity to achieve sustainable development having clear outcomes which demonstrate an improvement in not only the economic health of the Regions but also the environmental health and ecological resilience is desirable. To be successful in delivering this requires not only specific and measurable outcomes but ensuring that they are integrated into whole of the Regional Policy Statement.

Introduction and Planning Context

32. Section 32 requires that the objectives of the pORPS 2021 are examined for their appropriateness in achieving the purpose of the RMA and that the benefits, costs and risks of new provisions (primarily policies and methods) need to be clearly identified and assessed.

33. Since decisions were made on the pORPS 2021, there have been a number of changes in national direction, including amendments to existing national policy statements and consultation on new national direction. Of particular relevance for this evidence is the Exposure draft National Policy Statement for Indigenous Biodiversity, which I discuss further below.

34. As a result of consultation, the original issue statements were amended. The Significant Resource Management Issues for the Region (SRMR) section in Part 2 of the PORPS 2021 comprises a statement of the issues as well as a summary of their environmental, economic, and social impacts. Of the full list of SRMR the following are relevant to my evidence:

- SRMR–I3 Pest species pose an ongoing threat to indigenous biodiversity, economic activities and landscapes.
- SRMR–I7 Biodiversity loss rich and varied biodiversity has been lost and degraded due to human activities or the presence of pests and predators.
- SRMR–I11 Cumulative impacts and resilience – the environmental costs of our activities in Otago are adding up with tipping points potentially being reached.

Terrestrial indigenous biodiversity of Otago

35. The Appendices included in the Section 32 report commissioned by the ORC provide an overview of the terrestrial ecosystems and terrestrial biodiversity of the Otago Region.

36. I reviewed the following reports in the preparation of this evidence:
- "Mapping of significant habitats for Indigenous fauna in terrestrial, freshwater, and marine ecosystems in Otago region".[6] (Referred to as Wildlands 2020a).
- "Mapping of potential natural ecosystems and current ecosystems in Otago region."[7] (Referred to as Wildlands 2020b).

[6] Wildlands Report July 2020 (Contract Report No. 5015b).

[7] Wildlands Report July 2020 (Contract Report No. 5015a).

- "An overview of the state of the indigenous biodiversity in the Otago Region".[8] (Referred to as Wildlands 2021b).

37. Collectively these reports provide the science of what the RPS should address. They identify the key issues and set out conclusions.

38. Wildlands 2020a is an integrated overview of significant habitats of indigenous fauna. The report reviewed ten different databases of terrestrial fauna geospatial data to support its conclusions. The report included the large obvious relevant databases and complemented this with Wildlands staff knowledge.

39. Wildlands 2020a reported that Otago Region contains:
    - Breeding habitat for approximately 87 indigenous bird species, of which 38 are classified as Threatened or At Risk.
    - Significant habitats of forest birds including koekoea/long tailed cuckoo, South Island kaka, tītitipounamu/rifleman, toutouwai/South Island robin, pipirihika/brown creeper, and mohua/yellowhead.
    - Habitat for at least 24 currently recognised lizard taxa, of which all but three are classified as Threatened or At Risk.
    - One hundred and thirty-eight significant habitats of terrestrial invertebrates.
    - Freshwater habitats for 25 species of indigenous fish, of which 18 are classified as Threatened or At Risk.
    - Important terrestrial habitats of NZ Sealions.

40. Wildlands 2020a recognised the following issues as significant gaps in this review:

    a. A significant gap recognised in the report is the mapping of grey shrublands as significant habitats of indigenous forest birds. This is because the LCDB mapping of 'matagouri or grey scrub' is too inconsistent.

    b. The ability to identify actual significant habitats for terrestrial invertebrates is constrained by the lack of survey effort off Public Conservation Land. Figure 8 (Page 26) highlights the lack of consistent coverage of invertebrate habitats surveys in Otago. For example, the Eastern Rock and Pillar Range is mapped as a significant habitat of terrestrial invertebrates while the immediately contiguous Western Rock and Pillar Range is not. Similarly, areas in the Old Man Range appear to have property boundaries delimiting areas of significance rather than altitude or changes in vegetation cover. Figure eight is at best an initial preliminary assessment of the values present.

[8] Wildlands Contract report 5704a March 2021

c. The report focuses on inland breeding habitat for riverine and upland bird species and does not discuss the importance for these species of non breeding coastal habitats where species such as the threatened black-fronted terns, and banded dotterel move to in the autumn.

d. The mapping identified gaps in information, and from this priority areas were identified for surveys for lizards and long-tailed bats.

41. Wildlands 2020a notes that significance assessments have generally focussed on the identification of significant indigenous vegetation and much more rarely on the identification of significant habitats of indigenous fauna and that the sites identified by the mapping presented in this report (Wildlands 2020a) will help to address this deficiency.

42. I agree with this analysis by Wildlands and think that in the case of indigenous terrestrial fauna that Wildlands 2020a provides a clear justification that indigenous faunal values are present in Otago and need a clear policy framework in the Otago Regional Policy Statement to promote the management of adverse activities on these values.

43. In the report Wildlands 2020b the Land Cover Database (LCDB) was used as the basis for current indigenous ecosystem mapping. The report notes that LCDB contains widespread thematic and spatial inaccuracies so that while general patterns may be reliable, the outcomes at a particular site may be misleading. (Page 11). Wildlands 2020b further notes that indigenous LCDB cover types were better defined by classifying them into Singers and Rogers (2004) ecosystems.

44. Examples of where these inadequacies of the database may be significant include the saline ecosystems; cliff and rockland ecosystems; and successional ecosystems. The report highlights the methodological issues with identification of coastal ecosystems, such as SA7 Ice plant, glasswort herbfield/loamfield and SA9 *Olearia*, *Brachyglottis*, *Dracophyllum* scrub/herbfield/loamfield which are still present but are not captured as an indigenous cover type by LCDB, thus have no area or only minimal area.

45. Additionally, Wildlands 2020b noted due to the extensive modification of indigenous ecosystems below treeline, many indigenous cover types no longer support their original vegetation. This means that a straightforward intersect of potential ecosystems and indigenous cover would produce misleading results.

46. Despite these issues with methodology, overall this report paints a region wide picture of the current indigenous ecosystems and at a regional scale highlights the dominance

of narrow-leaved and slim snow tussock tussockland/shrubland, (Ecosystem type AL1: 414,328 hectares) in alpine areas, and an additional 328,509 hectares of LCDB 'tall tussock grassland' below treeline. This gives a total of 742,837 hectares of tall tussock grassland in Otago.

47. This is followed in quantum by some 212,643 hectares of broadleaved, podocarp/broadleaved, and/or beech forest, which is estimated to be approximately 10% of the original extent of indigenous forest across Otago. The report estimates at least 90,016 hectares of scrub and shrubland below treeline, and 28,447 hectares of bracken fernland have partially replaced this indigenous forest.

48. Wetlands have fared differently depending on whether they are lowland or upland ecosystems, as shown by the trends for WL16 red tussock, *Schoenus pauciflorus* tussockland and WL18 flaxland. Both occurred extensively (>6,000 hectares of each) in Otago prior to human settlement, but while WL16 red tussock, *Schoenus pauciflorus* tussockland remains extensive on Otago's upland plateaux, the lowland WL18 flaxland has been reduced to 25% of its original extent.

49. My conclusion is that at an Otago Regional wide scale the LCBD methodology maps the extent of these patterns robustly and can be used to inform the need and directions for policy in a Regional Policy Statement for the Otago Region. I support its use as the basis for understanding the diversity and pattern of terrestrial ecosystems in Otago. I also note that the LCDB does not adequately differentiate indigenous ecosystem types (esp. forest, wetlands and coastal) and that in the future closer order assessments should use the Singers & Rogers 2014 methodology (Singers & Rogers, 2014).

50. A third report: "An overview of the state of the indigenous biodiversity in the Otago Region (known as Wildlands 2021b) was also reviewed.

51. The conclusions of this report again emphasised the need for a clear policy framework in Otago for the identification and protection of indigenous vegetation and habitats of indigenous fauna from the adverse effects of resource use.

52. In particular the report Wildlands (2021b) concludes:
    - Otago has a range of nationally significant biodiversity features and values, and a significant responsibility for maintaining biodiversity nationally with respect to these values:
        - There are very extensive tracts of indigenous vegetation and habitats on the Main Divide ranges in the catchments of Lakes Whakatipu, Wānaka, and Hāwea.

- Extensive areas of Alpine grassland and herbfield habitats on the Central Otago block mountains that are key habitat for indigenous lizards
- Nationally significant inland saline habitats, an originally rare ecosystem classified as Critically Endangered, with only 10- 100 hectares remaining. These saline habitats support populations of Threatened indigenous halophytic plant species and include New Zealand's only salt lake, Sutton Salt Lake near Middlemarch.
- A nationally-significant assemblage of ephemeral wetlands, comprising approximately 3,000 wetlands, which are also originally rare, Critically Endangered ecosystems that provide habitat for numerous Threatened and At Risk plant species.
- Nationally significant populations of Threatened and At Risk freshwater fish.
- Nationally significant lizard populations, including grand skink (*Oligosoma grande*) and Otago skink (*Oligosoma otagense*), both classified as Threatened-Nationally Endangered, and both unique to Otago Region. Many other Threatened and At Risk lizard taxa are also present.
- Nationally significant forest habitats for species such as mohua, kea, kaka, Tautuku gecko, and long-tailed bat.
- Nationally significant populations of coastal indigenous fauna including marine mammals, pelagic seabirds, and penguins.

53. Otago has an important role to play in the maintenance of Aotearoa/New Zealand's indigenous biodiversity, because key features are only located in Otago. Consequently, Otago has a significant responsibility for maintaining biodiversity nationally with respect to these values.

54. 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/life style block development),
- Support a rich diversity of plants and animals,
- Support a disproportionally high number of threatened and rare species (especially plants),
- Are generally a threatened LENZ category

- Have several naturally rare ecosystems

55. Further work that complements the ecosystems and nationally significant biodiversity features identified in Wildlands 2021b is a review conducted by the Department into prioritising naturally rare and threatened ecosystems[9]. This report identified the following priority naturally rare and threatened ecosystems which are relevant in the Otago context:
    a. Limestone erosion pavements
    b. Ephemeral wetlands
    c. Inland outwash gravels
    d. Inland sand dunes
    e. Inland saline
    f. Coastal turfs

56. Naturally Rare ecosystems are defined as those comprising less than 0.5% of New Zealand's total area. They are small and patchy. The threats that these ecosystems face are often specific and need the development of new tools to manage them to maintain the values which are present. Additionally, there are major knowledge gaps as to how these ecosystems function which is preventing effective protection and management. These ecosystems are small in extent but contain a high proportion of endemic biodiversity, which is often threatened (See Plants Table Three). Some of these are present in other Regions of New Zealand with Otago containing important examples, and Inland saline ecosystems are only present in Otago.

57. An alternate way to illustrate the priority ecosystems and habitats in Otago for which policy in the Regional Policy Statement is justified and relevant is to use the Threatened Environment Classification system[10]. The Threatened Environment Classification 2012 combines data from three national databases – the Land Environments New Zealand (LENZ), the Land Cover Database (LCDBv4.0), and a 2012 update of the national protected areas network – into a simple six-category GIS tool. 'Threatened environments' (categories 1–5) are those environments in which much (>70%) of the original indigenous cover has been cleared and/or low proportions (30% of indigenous cover remains) and less than 20% of the land area is protected for the primary purpose of maintaining its natural heritage.

58. The Threatened Environment Classification is most appropriately used to provide information on the loss and protection context of indigenous biodiversity components

[9] Research Strategy for Prioritising naturally rare and threatened ecosystems. DOC Internal report DOC-6399695
[10] https://www.landcareresearch.co.nz/uploads/public/Discover-Our-Research/Environment/Threatened_Environment_Classification_2012.pdf?vid=3

identified on the ground. In the case of this evidence, I am using it as a tool to illustrate the geographical spread across Otago of the threatened environments to complement the Section 32 analyses that Wildlands 2020a completed.

59. The Threatened Environment Classification (TEC) is a source of national scale background information on New Zealand's land environments. Specifically, it shows how much native (indigenous) vegetation remains within land environments, and how past vegetation loss and legal protection are distributed across New Zealand's landscape. The TEC uses indigenous vegetation as a surrogate for indigenous biodiversity. This includes indigenous ecosystems, habitats and communities: the indigenous species, subspecies and varieties that are supported by indigenous vegetation, and their genetic diversity.

60. The TEC is most appropriately applied to help identify places that are priorities for formal protection against clearance and/or incompatible land-uses, and for ecological restoration to restore lost species, linkages and buffers (Cieraad et al., 2015). At the scale of the Otago Region this is illustrated in Figure One below. The figure shows the subset of threatened environmental classification which in the case of red areas have less than 10% of indigenous cover left and in the case of orange areas have 10-20% of indigenous cover remaining.

61. For ecosystems which are present at a large scale (i.e., 10's of ha) the LCDB mapping approach is appropriate. For smaller scales the Regional Policy Statement should complement the mapping approach with criteria which identify these systems regardless of size. In this context the criteria included in Appendix 1 of the Exposure Draft of the National Policy Statement for Indigenous Biodiversity[11] are appropriate (as addressed in paras 107-109).

62. It is my opinion that the criteria in Appendix 1 should be included in the pORPS to ensure that rare and threatened ecosystems regardless of scale in the landscape are assessed to determine significance.

[11] https://environment.govt.nz/publications/national-policy-statement-for-indigenous-biodiversity-exposure-draft/

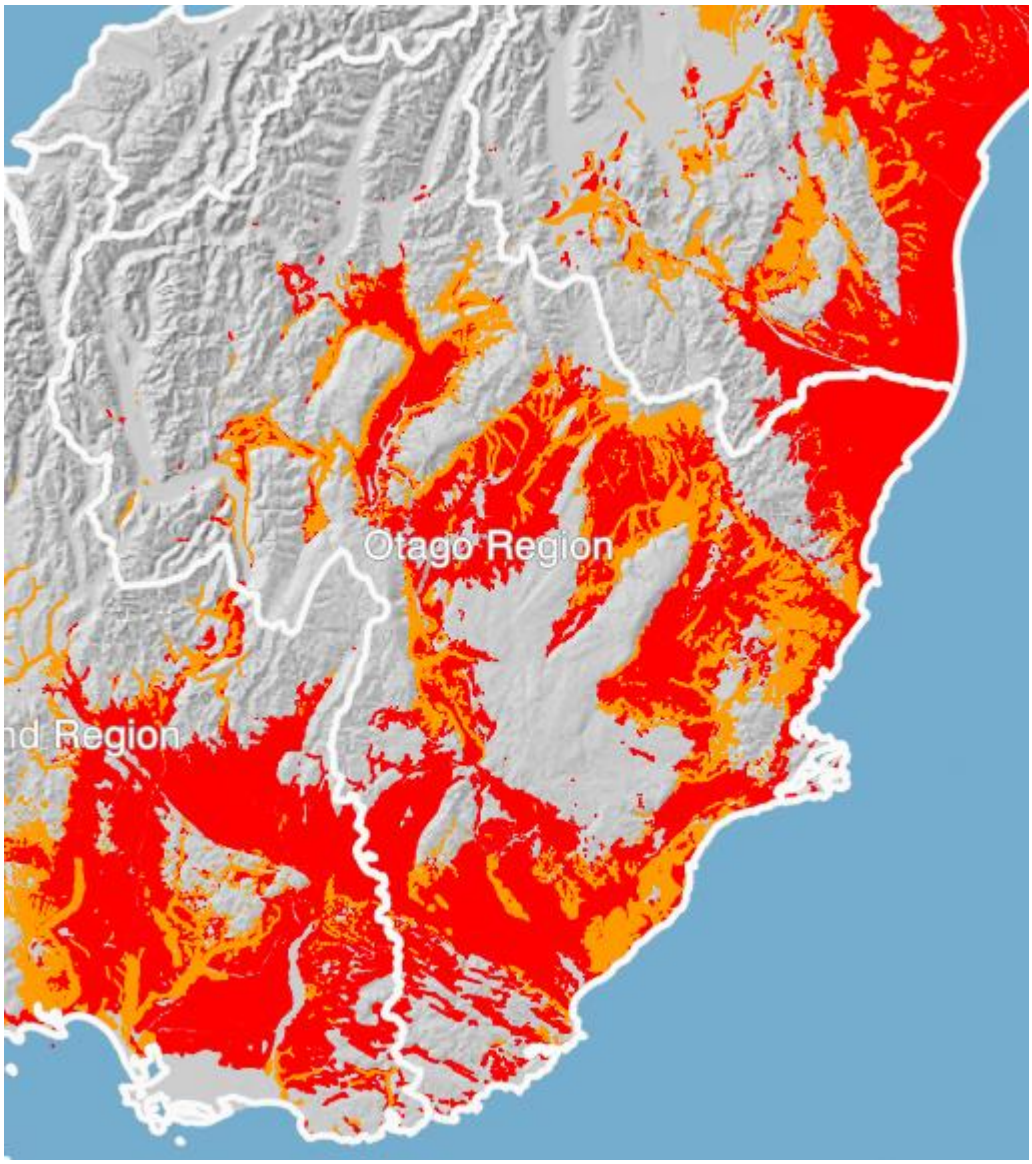

Figure One: Otago Region mapped with Threatened Environment classifications as follows: Red <10% indigenous cover left; Orange 10-20% indigenous cover left. Sourced from Manaaki Whenua[12]

Omissions in section 32 report information

63. An omission in the Wildlands reports is the lack of description of the particular values and attributes of the Upper Taiari (Taieri) and the Paerau Wetland Scroll Plain complexes. These wetlands are worthy of highlighting in the pORPS as:
    - They are the largest intact scroll plain complex in the Southern Hemisphere
    - They are also unique in New Zealand.

[12] https://ourenvironment.scinfo.org.nz/maps-and-tools/app/Habitats/lenz_tec/490,414,491

64. The relevant section 32 reports mention the Upper Taiari Scroll plain wetland but in the context of habitat for threatened birds[13], not as a distinctive aspect of the range of habitats of Otago. In their national classification of wetlands Johnson & Gerbeaux consider the Upper Taiari Wetland to be:

> "A riverine hydrosystem with an associated marsh or swamp wetland class in a riparian and floodplain wetland form. The Wetland is considered to have rushland, reedland, sedgeland, and grassland vegetation structural classes", (Johnson & Gerbeaux, 2004).

65. The pORPS provides a key point of reference to highlight this wetland complex and provide a context for coordinated management by the ORC and other agencies.

66. It is my opinion that the values present in the Upper Taiari scroll plain can be summarised as:

- It is a scroll-plain landform of meandering riverbeds and oxbow lakes in both the Styx and Maniototo Basins (Grove, 1994)
- The valley gradient in both these basins is such that frequent and prolonged high river flows inundate the floodplain and because of the nature of its surface considerable areas of water are left lying for up to several months,
- This leads to the presence of three distinct categories of wetland:
  - Permanent river and lagoons
  - Semi permanent shallow marshy areas created by flooding and which exist for two months or longer
  - Temporary (existing for less than two months or less on an average year) (Grove, 1994).
- The hydrologic process of seasonal inundation creates large sheets of shallow fertile water. Light penetration and warmth result in these areas producing large amounts of food both animal and vegetable. This food is available for a wide range of waterbirds.
- The river flats are a mosaic of vegetation types surrounded by exotic pasture. These include:
  - Crack willow forests
  - Crack willow and herb swamps
  - Carex rush sedgelands
  - Raupo Sedge swamps
  - Carex swamps
  - Tall tussock (*Chionochloa rubra*) grassland

[13] Wildlands Contract report 5704a (Page 4 page 353 of the pdf)

- Short tussock (*Poa cita*, *Festuca novae-zelandiae*) grasslands
- Carex glyceria rush swamp (Grove, 1994)

67. An overview of avi-faunal values is dated but includes the assessment that:
    - A total of twenty-seven wetland bird species have been recorded in this wetland from 12 families of birds.
    - The wetland is internationally important waterfowl habitat in terms of bird productivity, diversity in terms of species present and abundance in terms of numbers present, and the diversity of available habitats for foraging breeding and moulting.
    - The observations that the Upper Taiari Wetland makes significant contributions to the regional waterfowl populations with the endemic paradise shelduck, the native NZ Shoveler and grey teal all breeding here in significant numbers. As well, the introduced black swan and mallard are present in large numbers.
    - Additionally, numbers of white-faced heron, pukeko, pied stilts nest in adjacent wetland areas and utilise the wetland for foraging and raising of fledglings.

68. The size and the complexity of the meander pattern in the Upper Taiari is reported as:

    "*exceptional in a national context. The meander pattern has developed to a stage where natural cut offs are occurring and oxbow lakes are plentiful but not yet filled in with swamp material and vegetation*" (Grove, 1994).

69. The Upper Taiari wetlands compromise the only significant inland upland habitats of their kind left in the country. Despite past and recent modifications, the area is still a wetland with exceptional value as a splendid natural landform and wildlife habitat (Grove, 1994).

70. More recent assessments of biodiversity values have been more site specific. For example in 2018[14] and 2019[15] assessments of the 'Paerau Wetland' located in the Styx Basin concluded that the Paerau Wetland is considered to rank of moderate to high in terms of all five criteria used by (Davis *et al*., 2016). for the assessment of significant ecological values

71. These are:
    - Representativeness
    - Diversity and Pattern

[14] Glenayr farm, Taieri Scroll Plain wetlands, Styx Basin - inspection report Brian Rance Technical Advisor – Ecology Department of Conservation 4 January 2018 DOC-2956825

[15] Paerau wetland, Taieri Scroll Plain wetlands, Styx Basin - inspection report Brian Rance Technical Advisor – Ecology Department of Conservation Invercargill 28 January 2019 DOOC-5695183

- Rarity and special features
- Naturalness
- Ecological Context

72. As part of these site-specific assessment the following feature of the Paerau wetland were noted:
    - It lies on the Upper Taieri River (Styx Basin) scroll plain. This is a wetland of high ecological significance.
    - The vegetation of the Upper Taieri River (Styx Basin) scroll plain retains greater naturalness than the lower Taieri River (Patearoa) scroll plain
    - The area retains its hydrological functioning, including the natural flood regime of the Taieri River.
    - It retains many wetland areas and features, including oxbow lakes, the old (former) bed of the Taieri River, along with wetted depressions and other wetland features.
    - It contains samples of short, medium, long and permanent inundation ephemeral wetlands.
    - Tufted hair grass *Deschampsia cespitosa* is a stiffly erect green to yellow-green tussock, which stands 20–50 cm tall. It is indigenous to New Zealand and is present in the North, South, Stewart and Chatham Islands. Tufted hair grass has the threat status of At Risk – Declining. It has been estimated that there is a population present in the Styx Wetland of between 1000 plant, to as many as 2,500 plants. This site contains one of the largest populations known in Otago and nationally, therefore the site is considered to be a national stronghold for this species[16].
    - There are well defined vegetation sequences present, with the *Carex spp.* sedgelands being a particular feature
    - Although dominated by exotic grasses and other exotic species, it retains a range of native species. These native species are locally dominant and add natural character to the area.
    - It provides habitat for a range of waterfowl.

73. A third assessment completed in 2019[17] for a block on the Maniototo plain concluded:

> *The Taieri scroll plain has national/international significance, while the application block has values of regional (possibly national significance).*

[16] Glenayr farm, Taieri Scroll Plain wetlands, Styx Basin - inspection report Brian Rance Technical Advisor – Ecology Department of Conservation 4 January 2018 DOC-2956825

[17] Appleton Dairy Farm Ltd - Lower Taieri Scroll Plain – Inspection Report Brian Rance Technical Advisor – Ecology Department of Conservation Invercargill 22 December 2016 DOC-2945610

74. These areas are either mapped as part of or are immediately adjacent to Regionally Significant Wetlands shown in Schedule 9 of the Regional Plan: Water[18].

75. The Otago Conservation Management Strategy[19] identifies the Taieri scroll plain lies within the Central Otago Drylands/Manuherikia Place (Chapter 2.6). The text of the CMS includes –

> "*The scroll plain of the Taieri River is New Zealand's only scroll plain and is a large natural wetland full of loops, oxbows, ponds and channels lying in the centre of the Maniototo and Styx Creek basin. It is of national and international significance (see Appendix 9) and presents a dramatic image, especially when viewed from the air. Only a few parts of the wetland are protected and the area has undergone changes associated with land conversion, drainage and river engineering works*."

76. The CMS has the following relevant policies:
    - Policy 2.6.4 states "To work in consultation with others to protect and restore the Taieri River scroll plain."
    - Policy 2.6.5 states: "With the approval of landowners and with the support of the community, seek formal recognition of the Taieri River scroll plain as a Wetland of International Importance."
    - Policy 2.10.9 states: To "seek protection, and recognition as Wetlands of International Importance, for the Lakes Waipori and Waihola wetlands complex", and other sites in Otago.

77. The pORPS as notified does not recognise adequately recognise the of the Upper Tarari Wetland complex. It does specifically mention Tunaheketaha and the scroll plain, but this is not adequate for such a unique and large complex. The pORPS should be more explicit in the extent of the Upper Tarari Scroll Plain wetland and make reference to both the Styx Basin and Maniototo basin's components of the wetland.

78. The current Regional Plan: Water mapping, while providing some information, needs updating.

[18] https://www.orc.govt.nz/media/12421/regional-plan_water-for-otago-updated-to-4-june-2022-chapters-1-19.pdf
[19] https://www.doc.govt.nz/about-us/our-policies-and-plans/statutory-plans/statutory-plan-publications/conservation-management-strategies/otago/

79. A further example of the unique ecosystems present in Otago which need recognition in the Regional Policy Statement are the Inland saline ecosystems[20]. Otago Region contains nationally significant inland saline habitats, including areas of saline/sodic soils (salt pans) in the Maniototo and in the upper Clutha basin, and New Zealand's only confirmed inland salt lake at Sutton.

80. Inland saline ecosystems[21] are areas of soil where in the absence of leaching through rainfall, soluble salts have accumulated to such an extent that they are moderately to highly alkaline (pH > 7). Soils are not saline where rainfall is greater than 18 inches, but are present on brown-grey earths where rainfall is less than 18 inches. Saline soils accumulate from the weathering of several geological substrates: basement schist, ancient marine or lake sediments, and old alluvial gravels.

81. Because saline soils occur in semi-arid climates where evaporation of soil moisture leads to surface accumulation of salts, they occur patchily across this zone from the mid altitudes of Otago's block mountains down to basin and valley floors. Reports note that, in general, salt concentrations were not particularly high on the Maniototo Plains, but that localised, highly saline soils did occur, scattered through the areas with lower salt concentrations. Linnburn soils had the greatest salt concentrations, with the most saline of these on the valley floors of the streams draining Rough Ridge, south of Waitoi Creek.

82. Because the accumulated salts are toxic to most plants, saline soils generally support sparse, mostly herbaceous, vegetation. A range of herbs more characteristic of coastal estuaries and lagoons dominate the limited flora such as: *Lilaeopsis novae-zelandiae*, *Oxybasis ambigua*, native celery (*Apium prostratum subsp. prostratum var. filiforme*), *Selliera microphylla* and Buchanan's orache (*Atriplex buchananii*).

83. Threatened plants include the nationally critical New Zealand fish-guts plant (*Chenopodium detestans*), salt-pan cress (*Lepidium kirkii), Lepidium solandri*, and saltgrass (*Puccinellia raroflorens*), the nationally endangered *Crassula multicaulis*, the nationally vulnerable Buchanan's orache (*Atriplex buchananii*), New Zealand mousetail (*Myosurus minimus* subsp. *novae-zelandiae*) and *Myosotis brevis*, the declining *Oxybasis ambigua*, and the naturally uncommon blue wheat grass (*Anthosachne aprica*), and Cromwell broom (*Carmichaelia compacta*), .

[20] Wildlands Contract Report No. 5704a Page 3
[21] https://www.landcareresearch.co.nz/publications/naturally-uncommon-ecosystems/inland-and-alpine/inland-saline/

84. Threatened lichens include the nationally endangered *Buellia epigaea*, known only from one inland saline site in Central Otago, and nationally vulnerable *Acarospora murorum*.

85. The inland saline areas have a small but distinctive Lepidoptera fauna in the genus *Loxostege* (Crambidae): *Paranotoreas fulva* (Geometridae) which is restricted to Central Otago and two species, *Scythris triatma* (Scythrididae) and *Kiwaia thyraula* (Gelechiidae) that appear to be typical of salt-pans in parts of Central Otago.

86. Most inland saline sites have been destroyed by extensive pasture and irrigation development. There are relatively few weeds, but buck's horn plantain (*Plantago coronopus*) and several barley grasses (*Hordeum* spp) are serious threats to the relictual native flora on many patches. Many sites are grazed by stock, and rabbits graze on rare plants and erode others with their burrowing. Soil aggregate stability is low and consequently the potential for wind and stormwater erosion is high.

87. I have highlighted the Upper Tairai and Inland Saline System in my evidence as they are unique in New Zealand. I consider that the Otago Regional Council (and also the Central Otago District Council) through its respective planning tools needs to ensure that the ecological function of these areas is recognised provided for in plans and enhanced. The relevant sections of the Non freshwater pORPS are a key device for this to happen.

88. My overarching conclusion is that the large wetlands and lakes and rivers and their margins and, areas and ecosystems of significant indigenous vegetation and significant habitats of indigenous terrestrial fauna have been well described in the Appendices to the section 32A report. The Science underpinning the section 32A analysis is robust and justifies having provisions in a Regional Policy Statement that not only recognise these values but provide a statutory framework for their retention and enhancement.

89. There is more than adequate justification for the regional policy statement to give effect to higher order national direction instruments, including National Policy Statements (NPS), the New Zealand Coastal Policy Statement (NZCPS). I consider that, for it to be ‘successful’ the RPS needs to focus its Objectives, Policies and Methods on an integrated approach across the major environmental domains so that regional plans, district plans, and regional coastal plans have a clear integrated hierarchy to deliver robust environmental and biodiversity outcomes. I discuss this in more detail later.

90. In my opinion a major gap in the three Wildlands reports is the lack of descriptions of the floral values of Otago. Some species are mentioned as components or ecosystems of the ecosystems that they are typical of, but the plants themselves are species of equal status as (for example) are Otago skinks. But they are not discussed in the pORPS. In my opinion this approach will not deliver section 6(c) of the Resource Management Act 1991 (the Act, RMA) ("…*areas of significant indigenous vegetation* …"). It also fails to address parts of RMIA-MKB-I1 (page 88 Notified pORPS): "*Loss of indigenous flora and fauna remnants and lack of co-ordinated management of habitat*".

91. This lack of resource inventory is more acute in the next section of my evidence which discusses threatened indigenous biodiversity.

Threatened indigenous species in Otago

92. Te Mana o te Taiao, the Aotearoa New Zealand Biodiversity Strategy (ANZBS)[22], is New Zealand's overall strategic direction for biodiversity in New Zealand for the next 30 years. It is intended to guide all those who work with or have an impact on biodiversity. Vital to implementing the ANZBS is preventing the extinction of New Zealand's unique plant and animal species.

93. The recognised tool to assess the risk of extinction is the New Zealand Threat Classification System[23](NZTCS). This provides a framework for assigning a threat status to candidate taxa (Townsend et al., 2007). The structure of the threat classification system is summarised in Figure Two. The risk of extinction that a species or taxon faces is a critical facet of conservation management. Succinct listings of taxa by threat are often the basis for prioritising recovery programmes and research, monitoring the effectiveness of management efforts, gaining support for habitat protection, and in the current context assisting in natural resource decisions. Lists of threatened taxa can be compiled for particular taxonomic groups, sites or habitats, catchments, ecologically distinct areas, countries, regions and indeed the whole world.

94. The Department is accountable for developing and reviewing the system and ensuring that listings are carried out. Listings by taxon groupings are undertaken by independent expert panels, each of which is accountable for listing decisions for individual taxa.

[22] https://www.doc.govt.nz/nature/biodiversity/aotearoa-new-zealand-biodiversity-strategy/te-mana-o-te-taiao-summary/
[23] https://nztcs.org.nz/

95. The system has two fundamental aspects: a transparent consistent framework which is standardised for all taxonomic groups and the use of expert panels to undertake the assessments. This classification system has been designed so that any taxon that exists in the wild in New Zealand can potentially be listed.

96. The NZTCS includes both introduced and non-introduced (native) taxa; all native species are assessed. Finer-scale separation of levels of threat is provided for at risk and threatened taxa (seven categories) compared with non-threatened taxa (one category). Taxa are listed once only, at the lowest taxonomic level at which they have been described or recognition is proposed.

97. As the NZTCS enables managers to identify those species that are at elevated risk of extinction, and to measure the level and nature of that risk it allows us to focus our resources on the highest priority actions necessary to prevent extinction. To be able to deliver across all the domains a threat classification system needs to be applicable for all New Zealand's species groups, and so the system has been developed to apply equally to marine, terrestrial and freshwater biota.

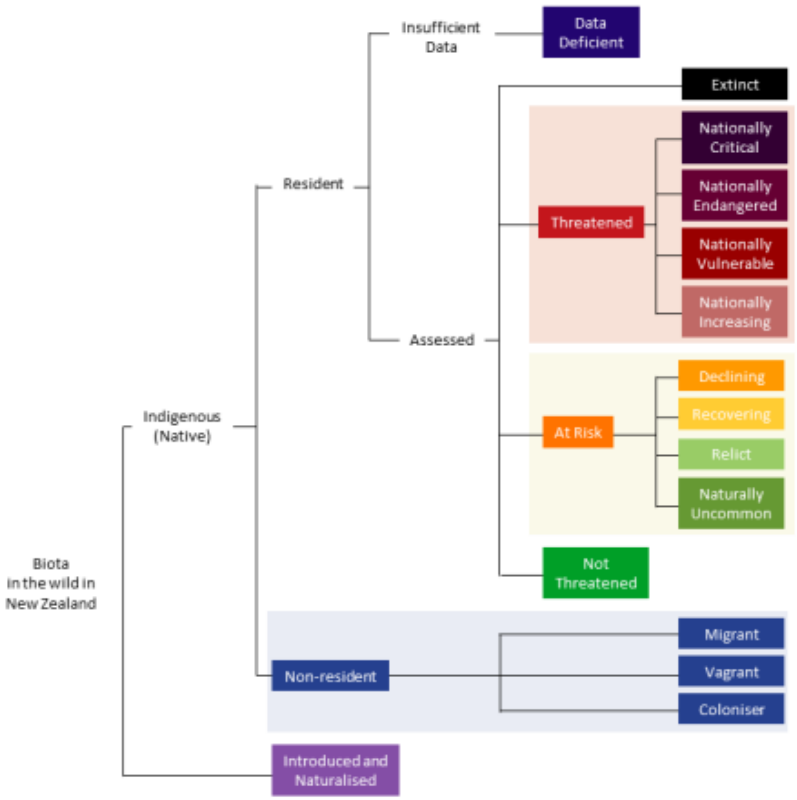

Figure Two: Summary of the structure of the NZ Threat classification System[24].

[24] https://nztcs.org.nz/

98. In the context of the pORPS, it is appropriate to use the NZTCS to set outcomes which are specific, measurable and time bound particularly for those species which are endemic to Otago.

99. An efficient approach is to be able to describe the outcomes the pORPS aspires to by linking the policies and outcomes expected of the pORPS to the threat classification of species and taxon as described by the NZTCS and to adopt objectives and outcomes in the Regional Policy Statement that directly relate to the assessed threat status of taxon.

100. The improvement of the threat classification of NZ indigenous biodiversity within Otago is dependent on clear direction in the pORPS, particularly for those species which are endemic to Otago.

101. Ensuring that the indigenous biodiversity values present in Otago have the expected positive outcomes for them should be assessed within the context of all the Objectives and Policies and Methods within the RPS. Such an approach requires the Outcomes for indigenous biodiversity to be integrated into any Land and Freshwater Management chapter in the RPS.

102. Having clear linkages between the outcome of change in threat classification and integrated management of all aspects of the Ecosystem within the RPS will lead to efficiencies in management and will enhance ecological management.

103. Wildlands 2020a (Table 2: Page 2) reviewed recent records of the distribution of threatened and at risk avifauna species in Otago. The threatened species are summarised in the table below. The threat classifications have been reviewed since the Wildlands 2020a report was (Robertson et al., 2021), so I have updated the assessment by including a column of the 2021 NZTCS assessments.

Table One: List of threatened birds species identified in Otago (Wildlands 2020a) and current threat classification. Not included = not listed in Table 2 of Wildlands 2020a. Not assessed= not listed in (Robertson et al., 2021). Green cells reflect an improved threat classification: red cells a decline in threat classification.

Common Name	**Threat Classification 2017**[25]	**Threat classification 2021**[26]
Kotuku/White heron	Not included	Threatened-Nationally Critical
Matuku/bittern	Threatened-Nationally Critical	Threatened-Nationally Critical
Black-billed gull	Threatened-Nationally Critical	At risk- Declining
Black stilt	Threatened-Nationally Critical	Threatened-Nationally Critical
Black-fronted tern	Threatened-Nationally Endangered	Threatened-Nationally Endangered
Kea	Threatened-Nationally Endangered	Threatened-Nationally Endangered
Reef heron	Threatened-Nationally Endangered	Threatened-Nationally Endangered
Southern rock wren	Threatened-Nationally Endangered	Threatened-Nationally Endangered
Yellow-eyed penguin	Threatened-Nationally Endangered	Threatened-Nationally Endangered
Wrybill	Threatened-Nationally Vulnerable	Threatened- Nationally increasing
Banded dotterel	Threatened-Nationally Vulnerable	At risk- Declining
Caspian tern	Threatened-Nationally Vulnerable	Threatened-Nationally Vulnerable
New Zealand kākā	Threatened-Nationally Vulnerable	Not assessed
SI kākā	Not included	Threatened-Nationally Vulnerable
Eastern Falcon	Not included	Threatened-Nationally Vulnerable

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Whio/blue duck	Threatened-Nationally Vulnerable	Threatened-Nationally Vulnerable
Australasian grebe	Threatened-Nationally Vulnerable	Threatened-Nationally Vulnerable
Long-tailed bat	Threatened-Nationally Critical	Threatened- Nationally Critical

104. The assessments in the table highlight that at a national scale the assessment of threat classification is dynamic and needs policy tools that can reflect this and can change with new information. This emphasises the need for policy in the PORPS to be inclusive and able to be updated with new information. They also highlight that for some species of avifauna a conservation response is a national matter as the species are wide ranging or 'mobile' (e.g., Caspian tern), but for others the use of policy in the pORPS is appropriate to manage adverse activities as these species are at a local scale and subject to the adverse effects of activities which could be managed by the pORPS and other planning tools.

105. Further Wildlands 2020a summarised recent records of threatened lizard taxa from Otago. The threat classification of these species based on the 2016 threat classification assessment is in Table three of Wildlands 2020a (page 17 of the report page 266 of the PDF). These are shown in the table below, and I have added updated data as a result of the 2021 re-assessment of reptiles (Hitchmough *et al*., 2021).

106. The right hand column notes which species are endemic to Otago. These species emphasise the importance of the PORPS having strong objectives, polices and methods to manage the adverse effects of activities on them and the habitats they occupy.

Table Two: List of threatened lizard species identified in Otago (Wildlands 2020a) and current threat classification (Hitchmough et al., 2021). Green cells reflect an improved threat classification: red cells a decline in threat classification.

Common name **Scientific name**	**Threat Status 2016**	**Threat Status 2021**	**Species endemic to Otago**
Green Skink *Oligosoma chloronot*on	At Risk-Declining	Threatened- Nationally Critical	
Orange-spotted gecko *Mokopirirakau* "Roy's Peak"	Threatened- Nationally Vulnerable	At Risk-Declining	Endemic
Lakes skink *Oligosoma* aff. *chloronoton* "West Otago"	Threatened- Nationally Vulnerable	Threatened- Nationally Vulnerable	
Nevis skink *Oligosoma toka*	Threatened- Nationally Vulnerable	At Risk-Declining	Endemic
Scree skink *Oligosoma waimatense*	Threatened- Nationally Vulnerable	Threatened- Nationally Vulnerable	
Rockhopper skink *Oligosoma* sp.	Threatened- Nationally Vulnerable	At Risk-Declining	
Tautuku gecko *Mokopirirakau* "southern forest"	Threatened- Nationally Endangered	At Risk-Declining	
Grand skink *Oligosoma grande*	Threatened- Nationally Endangered	Threatened- Nationally Endangered	Endemic
Otago skink *Oligosoma otagense*	Threatened- Nationally Endangered	Threatened- Nationally Endangered	Endemic
Alpine rock skink *Oligosoma sp.*	Threatened- Nationally Endangered	Threatened- Nationally vulnerable	
Oteake skink *Oligosoma* aff. *inconspicuum*	Threatened- Nationally Vulnerable	Threatened- Nationally Vulnerable	

Burgan skink *Oligosoma burganae*	Threatened- Nationally Endangered	Threatened- Nationally Endangered	Endemic
hura te ao gecko *Mokopirirakau galaxias*	Not assessed	Threatened- Nationally endangered	
Oteake skink *Oligosoma* aff. *Inconspicuum* "North Otago"	Threatened- Nationally Critical	Threatened- Nationally Vulnerable	

107. This table shows that as at 2015/16 there were eleven recognised taxa of skinks and geckos which were formally assessed by the expert panel against the criteria of the NZ Threat classification system present in Otago. Wildlands 2020a has added in a further three taxa which at this time had not been assessed.

108. Wildlands 2020a attempted to analyse the distribution of these species with more certainty but found this difficult to complete and recognised the need for field assessments to increase confidence of exactly what lizard taxa are present at site.

109. The overall pattern in the table and consequently for the species on the ground is that there is a significant endemic herpetofauna in Otago for which land use decisions in Otago will have a meaningful and long lasting impact. The values for herpetofauna are clearly present and so the pORPS needs to have policy and objectives which promote the management of adverse effects on these endemic and native biota. These need to be measurable within the context of Otago, consequently the use of outcome statements which measure the performance of the pORPS against threat classifications is appropriate.

110. The section 32 analysis failed to discuss the floral values that are present in Otago beyond using them as example of ecosystem structure. This omission is substantive when discussing the threatened biodiversity in Otago as section 6(c) of the Act identifies "*areas of significant indigenous vegetation as a matter of national importance*…". It also fails to address parts of RMIA-MKB-I1 (page 88 Notified PORPS): "*Loss of indigenous flora and fauna remnants and lack of co-ordinated management of habitat*".

111. Similarly, to the birds and lizards discussed previously, the NZ Threat Classification System includes the results of work on threatened plants. As a result of the 2017 reassessment 102 species of vascular plant species are considered present in Otago

(Lange *et al*., 2018). Of these nineteen are assessed as endemic to Otago. Of the 19 endemic species 18 species are ranked as Nationally Critical and one as Nationally Vulnerable.

112. Table three table summarises the threatened plants endemic to Otago and the current threat classification of these species.

Table Three: List of threatened plants species identified as endemic to Otago and current threat classification[27].

Taxon	Common name	Threat Classification 2017
Acaena aff. *rorida* (OTA 59561; Pool Burn)	a bidibid	Nationally Critical
Cardamine sciaphila	a bittercress	Nationally Critical
Carmichaelia hollowayi	Holloway's broom	Nationally Critical
Craspedia (a) (CHR 511522; Clutha River)	Clutha woollyhead	Nationally Critical
Craspedia (y) (CHR516260; Cape Saunders)	Cape Saunders woollyhead	Nationally Critical
Lepidium juvencum	a coastal cress	Nationally Critical
Lepidium kirkii	Kirk's inland cress	Nationally Critical
Lepidium sisymbrioides (formerly *L. sisymbrioides* subsp. *kawarau*)	an inland cress	Nationally Critical
Leptinella aff. *pectinella* (a) (CHR580894; Nevis)	a button daisy	Nationally Critical
Myosotis albosericea	Leaning Rock forget-me-not	Nationally Critical
Myosotis cheesemanii	Cheesman's forget-me-not	Nationally Critical
Myosotis oreophila	Dunstan Mtn forget-me-not	Nationally Critical
Myosotis umbrosa	forget-me-not	Nationally Critical

[27] "Southern New Zealand Region threatened plant list". Unpublished data compiled by Brian Rance. Stored as DOCDM-1339921 Accessed 26 October 2022.

Myosotis aff. *glauca* (a)(WELT SP104520; "Mata-au")	Mata-ua forget-me-not	Nationally Critical
Myosotis (d) (WELT SP089763/A; Rock and Pillar)	Rock & Pillar forget-me-not	Nationally Critical
Puccinellia raroflorens	a salt grass	Nationally Critical
Helichyrsum aff. *intermedium* (c) (*Helichrysum selago* var. *tumidum* Cheeseman; WELT SP058412)	Otago Peninsula whipcord daisy shrub	Nationally Vulnerable

113. Of note in this table is that six of these species are only found in only one location e.g. the “Clutha Woollyhead. Some are endemic to particular rare or restricted ecosystems e.g. *Lepidium kirkii and Pucinellia raroflorens* which are restricted to saline sites while others do not have obvious obligate relationships with particular ecosystem attributes. Some of these species are considered at imminent threat of extinction (e.g. Clutha woollyhead which has a total population of c. 30 plants). Some of these species are found mostly off Public Conservation Land.

114. However, the key issue here is that these species are restricted to Otago and decisions made in the Otago RPS will materially affect the impact of adverse land uses on these species. Consequently, I disagree with the supplementary statement of evidence prepared by Dr Jarvie of the ORC (20 September 2022)[28] in which he seeks to not have statements relating to the Change in the threat classification of species included in ECO-01 of the Regional Policy Statement.

115. In this evidence I have demonstrated that while some species are mobile and need to be managed at a national scale, others are sessile or have a range restricted to Otago.

116. I am of the opinion that adopting Appendix 1 (E draft NPSIB) into the Otago Regional Policy statement will reflect best practice and will also give clear guidance as to how the Region should implement the NZ Threat Classification rankings in Otago.

117. My conclusion is that the Section 32 Analysis documents a wide range of important biodiversity values in Otago which are worthy of recognition in the Regional Policy Statement. The omission of an analysis of threatened plants is significant and should be rectified in the RPS. I adopt the significance criteria in Appendix 1 of the National Policy Statement-Indigenous Biodiversity as it is the current best practice nationally and has been well tested by engagement with stakeholders nationally.

[28] https://www.orc.govt.nz/media/13062/tech-statement-of-evidence-scott-jarvie.pdf

Naturally uncommon and Naturally rare

118. In the NZCPS[29] Policy 11 Indigenous biological diversity uses “naturally rare” as an assessment to protect from adverse effects.

119. In the Notified version of the pORPS “Naturally Rare” [30]was defined as:

> *has the same meaning as in the Glossary of the New Zealand Coastal Policy Statement 2010 (as set out in the box below) "originally rare: Rare before the arrival of humans in New Zealand*“

120. Naturally Rare is used in CE-P5 (1) (c) & (d)[31],and APP4[32] of the pORPS. However, it is not used in the NPS Freshwater Management 2020.

121. In the notified pORPS “Naturally uncommon” is used in APP2 (d)(i) and APP4(1)(c)[33]

122. In the pORPS supplementary evidence. “Naturally Rare” has been:
    - retained in the definitions unchanged
    - retained in both places in CE-P5 where it was originally, and
    - removed from APP4 (1) (c)

123. In the PORPS supplementary evidence “Naturally uncommon” has been added into APP3 (1)(d).

124. The choice of the appropriate phrase was discussed further in Wildlands 2022[34]. The report points out that the terms ‘historically rare’, ‘originally rare’, ‘naturally rare’, and ‘naturally uncommon’ are synonymous and all refer to ecosystems that were naturally uncommon in Aotearoa New Zealand prior to the arrival of humans and that more recently, the term ‘naturally uncommon’ has been used as well.

125. Consistent usage would be useful here, but the RPS is subject to inconsistencies in previous high level documents (eg NZCPS and E draft NPSIB) and so it is difficult.

126. The E draft NPSIB[35] uses both in Key Assessment Principal Criterion C (Page 33). So current best practise thinking as set out in the NPS accords with the Ecological advice

[29] https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/coastal-management/nz-coastal-policy-statement-2010.pdf
[30] Page 29
[31] Page 203
[32] Page 206
[33] Page 205 & 206
[34] Ecological Advice on Biodiversity Policy in the proposed Otago Regional Policy statement. Contract Report No. 6299
[35] https://environment.govt.nz/assets/publications/NPSIB-exposure-draft.pdf

developed as part of the Section42 Reporting and that either phrase can be used in the pORPS.

Integrated management of Ecosystems and Indigenous Biodiversity and Land and Freshwater Policy

127. It is my view that integrated management, in this context, is focussed on the notion that everything is connected. It is therefore appropriate to take into account and provide for those interconnections and interdependencies in the approach to resource management in Otago.

128. Paragraph 101 of the Section 32 Report[36] reaffirms this:

> "*In the main, the benefits accrue to the environment and arise from the adoption of holistic approaches to the use, development, and protection of natural and physical resources where all the implications of each proposal are considered. At a regional level, these benefits are considered to significantly outweigh any costs of having to implement an integrated approach to resource management*."

129. The only effective way to ensure that there is an integrated approach to the development and delivery of biodiversity and economics outcomes in Otago is to have an integrated approach within the RPS. This is reflected in Section 59 of the Act which states the purpose of the Regional Policy Statements is

> "…*an overview of the resource management issues of the region and policies and methods to achieve integrated management of the natural and physical resources of the whole region."*

130. This is reiterated at para 92 of the Section 32[37] report:

> *"The integrated management of the natural and physical resources of the Otago region is at the heart of the planning approach to resource management as expressed in the PORPS".*

131. My opinion is that in order to build ecological resilience in the Otago Region the pORPS should be looking for opportunities to default to an integrated approach to ensure resilience across ecological domains.

132. Trying to separate policy out into silos leads to perverse outcomes for biodiversity and economic activity. Royal albatross spend most of their lives at sea well beyond the territorial limits of New Zealand. However, they are obligated to return to land to lay an egg, hatch and raise a chick by returning each day to the see to gather food. Similarly,

[36] Page 27
[37] Page 24

kotuku in New Zealand utilise wetlands throughout New Zealand but each spring return to South Westland to roost in a tree, rebuild pair bonds, lay a clutch of eggs, and raise a brood of chicks which they fee with prey from adjacent coastal lagoons.

133. These are examples with different time and space attributes that illustrate why integrated management for biodiversity is required for policy which delivers coherent outcomes, across both production and indigenous landscapes. The more an ecological system is partitioned the less resilient is becomes and the more at risk the constituent parts of the system are at of a perturbation causing irretrievable damage or not returning to a normal state.

134. The separation of Land and Freshwater and Land and Soil objectives and policies from Ecosystems and Indigenous Biodiversity objectives and policies is a fundamental recognition that these two chapters (as set out in the PORPS) can compete for dominance rather than driving a clear message that land, freshwater ecosystems, coastal ecosystems, economic production and indigenous biodiversity are all competing for the same space and time and that they need to be assessed equally in all processes.

135. The submission of the Director-General has already highlighted the lack of clear recognition and/or links to the ECO Policies and has promoted relief that linking the two needs improved wording.

Ecological resilience

136. In ecology, “resilience” is the capacity of an ecosystem to respond to a perturbation or disturbance by resisting damage and recovering quickly. Such perturbations and disturbances can include stochastic events such as fires, flooding, windstorms, insect population explosions, and human activities such as deforestation or afforestation, and the effect of exotic plant or animal species.

137. Disturbances of sufficient magnitude or duration can profoundly affect an ecosystem and may force an ecosystem to reach a threshold beyond which a different regime of processes and structures predominates. When such thresholds are associated with a critical or bifurcation point, these regime shifts may also be referred to as critical transitions.

138. Human activities that adversely affect ecological resilience such as reduction of biodiversity, exploitation of natural resources, pollution, inappropriate land use, and anthropogenic climate change are increasingly causing regime shifts in ecosystems, often to less desirable and degraded conditions.

139. This is discussed in more detail in SRMR–I11:

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

140. In this section of the pORPS the following points are made *(inter alia*):

- The long term environmental, economic, and social well-being of the Otago region requires anticipating and minimising cumulative environmental impacts before they reach a tipping point, beyond which systems can no longer properly function.
- This requires resilient frameworks that take account of the dynamic relationship between the environment, economy and people while acknowledging that the future is always uncertain, and knowledge is imperfect.
- While many ecosystems have a degree of resilience, increasing pressures on the environment, typically as a result of human activities, can have an adverse cumulative effect.
- Climate change also has the potential to seriously challenge ecosystem adaptive capacity. Much work is being undertaken to address this challenge, but it is still possible that permanent changes may occur (tipping point).
- The first and best response is to ensure sustainable management of our natural resources and avoid immediate and long-term cumulative effects that degrade the environment.
- At the same time a resilient approach is needed that identifies thresholds and sets limits on the use of natural resources to avoid permanent and potentially catastrophic changes occurring, as would occur if a tipping point is reached.

141. I adopt these points and it is my opinion that integrated management is a key tool to meet the tests of Section 59 of the Act and will promote resilience if the policy frameworks through the RPS deliver this as a key expectation of Objectives, Policies and Methods.

142. In the complexity of natural resource management, the more that people centric and indigenous biodiversity interact in the same policy framework the more the outcomes will be integrated and the more that this will build resilience in ecological systems.

143. It is my view that having separate chapters for Land and Freshwater, and ECO will lead to a failure to promote integrated management of the natural resources of Otago and that this part of the Notified pORPS needs a significant re-examination of structure

to ensure that integrated management is core to the RPS and delivers positive outcomes for Otago.

Ecosystems and Biodiversity (ECO)

Outcomes for Otago

144. In my opinion the purpose of the pORPS is to achieve the objective of the Act by making effective policy for the economic and environmental natural resources of Otago. Being able to demonstrate that policy methods and rules are making a difference for these resources requires clear objectives with comprehensive bottom lines. Consequently, the pORPS should clearly outline the biodiversity outcomes that it seeks for the resources described in the section 32 Reporting and in the case of threatened plants included in this evidence. An outcome statement that sets a high level result for species and ecosystems is appropriate.

145. The notified RPS has the following objective:
"ECO–O1 – Indigenous biodiversity
Otago's indigenous *biodiversity* is healthy and thriving and any decline in quality, quantity and diversity is halted".

146. I consider that this wording is weak and lacks a clear purpose as quality and quantity are not defined.

147. Subsequent Polices P2-P4 seek to use the SNA assessment process to identify places of significance. This is important and I agree that it needs to be done, but without a strong clearly defined outcome for the region as a whole the SNA mapping process will lack direction and clarity as to purpose and intention.

148. In my opinion having clear statements which have clear measures of the change expected of the PORPS is an effective method to measure the effectiveness of the ECO policy as written as well as the performance of the PORPS as a whole. It is my view that such outcome statements are required to promote sustainable management of Otago's resources and integrated management.

149. To provide that clarity, I recommend that ECO-O1 be amended to include the following:
- That there is no worsening of the threat classification of indigenous threatened species in Otago;
- In the term of the RPS the threat classification of threatened indigenous species in Otago will be improved;
- Areas of significant indigenous biodiversity will be mapped and protected;

- Threatened ecosystems will be protected in Otago;
- That there is no further loss of LENZ environments that are threatened or At Risk (i.e. <30% of indigenous cover remains);
- That there is no further loss of naturally rare ecosystems or ecosystems that have been heavily depleted.

150. The last two clauses were not included in the D-G's submission on the pORPS, but I recommend them based on my subsequent consideration of the issues.

151. The D-G's approach was rejected in the section 42A analysis for the following reason:

> "as threat classification of a species found in Otago might not always be dependent on what occurs within the Otago Region."

152. This analysis is inadequate, as for many threatened species they are found only in Otago and consequently Objectives and Policy set within the Regional Policy Statement will be fundamental to managing the adverse effects of activities on those species.

153. For example, the grand skink is found near Macraes Flat and in the Lindis area. Similarly, *Oligosoma chloronoton* another large lizard is found south from the Mackenzie Basin to Rakiura. A large proportion of known records are from Otago. Strong policy in the PORPS would lead to measurable outcomes for this species in Otago.

154. What I have recommended here is consistent with the Fundamental Concepts (Section 1.5, page 4/5/6) of the E draft NPSIB. At the time of writing this has yet to be gazetted but the exposure draft contains language and standards which in my opinion are necessary to meet the objectives of the Act.

155. The relevant Fundamental Concept is:

(3) Maintenance of indigenous biodiversity

The maintenance of indigenous biodiversity requires at least no reduction, as from the commencement date, in the following:

(a) the size of populations of indigenous species:

(b) indigenous species occupancy across their natural range:

(c) the properties and function of ecosystems and habitats:

(d) the full range and extent of ecosystems and habitats:

(e) connectivity between, and buffering around, ecosystems:

(f) the resilience and adaptability of ecosystems.

156. In my opinion accepting this standard of commitment to indigenous biodiversity in the pORPS is necessary to achieve the objectives of the Act and to ensure that indigenous biodiversity is protected from the effects of adverse activities in Otago.

Wilding pines

157. It is my opinion that ECO-P9 "Wildling Conifers" is equally lacking. The location and content of this policy implies that wilding conifers are only an issue for biodiversity, when in fact they can also significantly impact other matters such as agricultural land use and catchment hydrology, (possibly an adverse land use effect) or when they are planted for plantation forestry (possibly a beneficial land use effect).

158. This is a complex problem that needs a carefully structured integrated policy framework. Two of the ten most spread-prone conifer species in New Zealand are important commercial forestry species (*Pinus radiata* and *Pseudotsuga menziesii*). These two species make up 96 percent of the plantation estate and are the principal contributors to the $4.3 billion of forestry exports (MPI, 2014).

159. Indigenous ecosystems that are at particular risk from wilding conifer invasion include (Froude, 2011):
    - Tussock and other indigenous grasslands
    - Alpine ecosystems
    - Subalpine and dryland scrub and shrublands
    - Frost-flats
    - Wetlands
    - Turf communities
    - Geothermal areas
    - Dunelands
    - Rockfields and herbfields
    - Riparian areas
    - Coastal margins, bluffs and cliffs.

160. Wildlands 2020b[38] identifies that all but geothermal systems are present in Otago.

161. The effects of inappropriately located wilding conifers can be summarised as (Froude, 2011):

[38] Wildlands Report July 2020 (Contract Report No. 5015a).

- Wilding conifers grow faster and taller than low-stature indigenous vegetation and indigenous tree species.
- Wilding conifers shade out many of the native plant species and can change soil characteristics.
- In some cases, wilding conifer spread may lead to the local extinction of native plant communities.
- Wilding conifer species (e.g. contorta pine, mountain pine and Corsican pine) are able to grow at altitudes above the local treeline formed by indigenous forest species.
- Due to its higher tolerance of shade, Douglas fir is one of the few introduced conifer species that is capable of invading canopy gaps in native forests. Douglas fir is able to spread into shrublands and regenerating native forests before canopies close
- Where Douglas-fir seed or seedlings are present when native plant communities suffer disturbance, then wildings may establish, and possibly dominate, before the native species recover sufficiently to become the dominant cover.
- Conversion from native tussock grassland to radiata forest can lead to a reduction in: soil pH, exchangeable calcium, magnesium, potassium and iron. There can be lower levels of microbial biomass for carbon, nitrogen and phosphorus in the mineral soils under radiata pine, compared to tussocks reflecting lower soil organic matter inputs to the mineral soil. These changes can affect the soil fauna.

Effects on indigenous species

162. Where low stature indigenous vegetation is overwhelmed by wilding conifers, there may be local extinctions of individual species. For example populations of *Veronica (=Hebe) armstrongii* in the Waimakariri Basin and *Veronica (=Hebe) cupressoides* throughout the high country are threatened by wilding conifers. Native lizards and invertebrates of open communities can also be threatened because of wilding pines overtopping indigenous habitats.

Effects on pastoral farming and forestry

163. Wilding conifers can invade extensive pastoral farming based on indigenous tussock grasslands and other low stature indigenous vegetation that may have been considerably modified by historical land management practices (e.g. repeated fires and over grazing) and invasion by introduced plant and animal species. Once wilding conifers spread onto such marginal farmland the active control required may be difficult for the landowner/ occupier to justify financially given the marginal worth of the land for grazing.

164. Data from a number of New Zealand catchment studies have shown that where pasture has been replaced by radiata pine forest, there has been a reduction in annual surface water yields of 30-81%, with the upper end of the range being observed in the dry South Island sites (Froude, 2011).

165. The characteristics of wilding conifers and their potential to dominate indigenous vegetation have landscape/visual amenity as well as ecological consequences. These landscape impacts are generally greatest in landscapes currently characterised by indigenous tussocklands and other low stature indigenous. The South Island high country landscapes are important for tourism. Large-scale landscape changes could adversely affect the industry in these areas. Apart from the change to a unique and indigenous environment (and hence New Zealand's tourism product), there are potential tangible impacts on tourism.

166. The extensive environmental effects of wildling pines against a multiplicity of values highlights the need for the integrated management of this threat within the Land and Freshwater chapter of the pORPS. At the national level the NZ Wildling Conifer Management Strategy 2015-2030 (MPI, 2014) aims to support effective collaboration between land occupiers, researchers, regulators and communities to address the critical overarching issues facing wilding conifer management.

167. It seeks to do this through recognising that:
    - Wilding conifer management is complex. It often involves a wide range of parties with different drivers or objectives.
    - Control operations can be large and long-term, requiring significant investment across multiple parties and land tenures.
    - There is a need for better leadership (at all levels), co-ordination and prioritisation of control efforts.(MPI, 2014).

168. Regardless of where the objectives policy and methods relating to wilding conifers ends up in the pORPS the reference to buffers (page 144 (1b)) is ineffective without having clear policy of the expected outcomes anticipated by the establishment of buffers.

169. This is important because wind is the main dispersal vector in the South Island, where seed dispersal distances of several kilometres are common. For example, P. contorta wildlings dispersed from Mid Dome plantations in Southland indicate that in most years seedlings establish up to 4.5 km, and in some years 8 km, downwind from the source (Hunter & Douglas, 1984).

170. Overall, my conclusion is that there are multiple impacts and objectives that are required to be recognised in responding to the adverse effects of wildling conifer. These do require consideration in a Regional Policy Statement and the necessary objectives, policies and methods need to be within a land management context not a biodiversity context.

Weed Control and Pest control

171. ECO-P10 (6) sets a policy to implement an integrated and coordinated approach that in part adopts a regulatory and non-regulatory regional pest management programme. An allocation of responsibilities is contained in ECO-M4, & M5. There is no reference to an expected outcome from this work.

172. Section 1.1 of the 2019 Regional Pest Management Plan[39] has the following purpose:
    - "The purpose of the Plan is to outline the framework to efficiently and effectively manage or eradicate specified organisms in the Otago region.
    - Doing so will:
        - minimise the actual or potential adverse or unintended effects associated with those organisms; and
        - maximise the effectiveness of individual actions in managing pests through a regionally coordinated approach."

173. SRMR-I3 identifies the pest context in Otago and makes the following points:
    - Pest species can be found throughout Otago, from alpine to marine environments.
    - Rabbits are changing Central Otago's landscape, eroding soils and affecting agriculture.
    - Wilding conifers threaten high country and tussock grassland,
    - Aquatic pests and weeds such as didymo, lake snow and lagarosiphon affect our lakes and rivers.
    - Invasive marine species affect our marine waters.
    - There are 35 listed weed species in Otago, and 11 listed animal pests.
    - Pest management approaches include exclusion and surveillance, attempted eradication, containment and sustained control.

[39] https://www.orc.govt.nz/media/10068/orc-regional-pest-management-plan-2019-29_final_corrected-21.pdf

- The Otago Pest Management Plan 2019-2029 seeks to meet ORC's responsibilities under Part 2 of the Biosecurity Act 1992 to provide regional leadership through activities that prevent, reduce, or eliminate adverse effects resulting from harmful species that are present in the region.
- Plant and animal species pests have significant impacts on biodiversity and productive landscapes:
- Costs to agriculture, business and government to control pests and mitigate impacts are considerable, as are biosecurity costs to prevent pest incursion which are reflected in biosecurity fees and taxes. Biosecurity failure can have serious economic impacts on existing industries.
- Pests also adversely affect tourism through loss of landscape values (e.g. wilding pines) and amenity values (e.g. didymo compromising fishing) which lead to reduced visitor experiences. Weeds, for example, are conservatively estimated to cost the New Zealand economy $1.6 billion per annum in terms of loss of economic production, management and control costs.

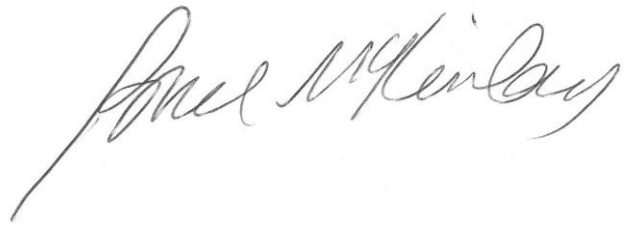
174. Similarly, SRMR-I7 identifies the impact of pests and predators on the biodiversity of Otago. SRMR-I7 identifies the short-term impacts as:
    - a loss of productivity or increased costs of pest management occur and longer-term impacts as:
    - a net loss of natural capital in the region over time.

175. The economic costs of lost productivity due to pests, and damage to land, can be significant without an appropriate management response for both productive landscapes and biodiversity values.

176. Reflecting the purpose of the Regional Pest Management Plan in the Regional Policy Statement or more appropriately inserting an outcome statement into the pORPS which sets out clearly the expected outcomes of this work and how it is to be integrated across other Policy in Otago is justified when as I shown pests impact adversely on such a wide range of activity and values in Otago.

177. I recommend that a new policy to include outcome statements for Regional Pest Management is inserted into the pORPS.

178. Such an inclusion would benefit from having “pest" defined in the pORPS. I note submissions from Federated Farmers and Wayfare both request ‘pest’ to be defined. This was discussed in the section 42A report and the conclusion in the report was that the definition from the Biosecurity Act was appropriate. This is: “‘*means an organism specified as a pest in a pest management plan”.* I support the inclusion of this in the RPS.



23 November 2022

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