BEFORE THE HEARINGS PANEL

UNDER the Resource Management Act 1991

IN THE MATTER of the Proposed Otago Regional Policy Statement 2021

STATEMENT OF EVIDENCE OF MARIA BARTLETT

ON BEHALF OF WAIHŌPAI RŪNAKA, TE RŪNANGA O ŌRAKA-APARIMA AND TE RŪNANGA O AWARUA

23 November 2022

INTRODUCTION

1. My name is Maria Bartlett.

2. I have over twenty years' experience in resource management strategy, policy and planning. I spent much of the first decade of my career in resource consents for Canterbury Regional Council and over a decade now within the Kāi Tahu tribal structure. Over the years I have been focussed on freshwater management, petroleum and minerals, the Exclusive Economic Zone, climate change and local government relationships with iwi and hapū. Whilst working for Kāi Tahu I have been involved in resource consent processes; regional plan development and plan changes; regional policy statements; Environment Court mediations and hearings; Board of Inquiry processes; resource management and local government reform; as well as producing the tribal climate change strategy[1]; and the first Mana Whakahono a Rohe agreement[2].

3. I am a certified RMA decision-maker. Within the last year I have sat on panels deciding applications for mineral sand mining proposals on the West Coast. I have been recently appointed to a Board of Inquiry for the Environmental Protection Authority.

4. I am currently employed by Te Ao Mārama Incorporated as Kaitohutohu Matua where I have been since 2019. Te Ao Mārama is the regional environmental entity that represents Waihōpai Rūnaka, Te Rūnanga o Ōraka-Aparima and Te Rūnanga o Awarua in resource management matters.

5. I contributed to development of the proposed Otago Regional Policy Statement (pORPS) through group topic sessions, direct engagement with Otago Regional Council (ORC) and co-drafting.

6. Although this is a Council hearing, I confirm that I have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2014 and have complied with it in preparing this evidence. I confirm that the issues addressed in this evidence are within my area of expertise and I have not omitted material facts known to me that might alter or detract from my evidence.

[1] Te Tāhū o Te Whāriki – Anchoring the Foundation. He Rautaki Mō te Huringa o te Ahurangi Climate Change Strategy, as referenced in the evidence of Ms Stevens - Ngāi-Tahu-Climate-Change-Strategy.jpg (600×450) (Ngāitahu.iwi.nz)
[2] Mana Whakahono a Rohe Arrangement_WebInteractive.pdf (wcrc.govt.nz)

7. My evidence primarily addresses the submissions of Waihōpai Rūnaka, Te Rūnanga o Ōraka-Aparima and Te Rūnanga o Awarua, made on their behalf by Te Ao Mārama. I use the collective term Ngāi Tahu ki Murihiku in reference to these Papatipu Rūnanga.

8. The key documents I have referred to in drafting this brief of evidence are:

   (a) Resource Management Act 1991 and relevant instruments of national direction;

   (b) Te Rūnanga o Ngāi Tahu Act 1996 and Ngāi Tahu Claims Settlement Act 1998;

   (c) Te Tangi a Tauira, the Cry of the People, Ngāi Tahu ki Murihiku Natural Resource and Environmental Management Plan 2008;

   (d) Cultural and planning evidence prepared for Te Rūnanga o Ngāi Tahu and Kāi Tahu ki Otago, and cultural evidence of Evelyn Cook;

   (e) Proposed Otago Regional Council Regional Policy Statement 2021 and Section 32 evaluations; and

   (f) Section 42A reports and supplementary evidence.

9. In this brief of evidence, my further recommended amendments to the Section 42A or supplementary evidence version of the pORPS are shown in blue, with underline for additions and strikethrough for deletions.

SCOPE OF EVIDENCE

10. As part of the overall Kāi Tahu suite of evidence, my evidence is to be read in conjunction with the planning evidence of Sandra McIntyre, Michael Bathgate, and Tanya Stevens. I generally agree with the evidence of these planning witnesses unless otherwise stated.

11. My evidence covers:

   (a) Ngāi Tahu ki Murihiku as mana whenua and their relationship with the pORPS;

   (b) Whole of pORPS submission points made by Ngāi Tahu ki Murihiku, including:

      (i) interim frameworks;

(ii) management of dams and weirs;
(iii) wāhi tūpuna;

(c) The relationship with the Cain whānau submission and evidence;

(d) Discussion of particular matters and submission points raised by Ngāi Tahu ki Murihiku:

(i) land-based primary production;
(ii) environmental limits;
(iii) habitat of trout and salmon;
(iv) "control" and "manage";
(v) effects management hierarchy;
(vi) forward or mihi, purpose, and description of the region;
(vii) coastal environment;
(viii) ecosystems and indigenous biodiversity; and
(ix) contaminated land.

12. I note for the panel that Te Ao Mārama was unable to address all matters in pre-hearing discussions due to timeframes and capacity constraints. My evidence addresses any remaining points that were missed through that process.

NGĀI TAHU KI MURIHIKU

Mana whenua

13. The pORPS is a landmark planning instrument for Otago because it is the first regional policy statement for the Otago region that recognises the standing of Waihopai Rūnanga, Ōraka-Aparima Rūnanga and Awarua Rūnanga as mana whenua (p59 of the pORPS). Refer to the evidence of Evelyn Cook at paragraph 10. Statutory recognition has existed since 2001[3] but this has not been reflected in regional planning instruments until now. As a matter of practice Kā Tahu ki Otago (through Aukaha) have taken the lead in resource management in the region due to resource and capacity constraints, which have been improved in recent years as Te Ao Mārama has expanded. It is significant that parts of the pORPS were co-drafted between the regional council and both Aukaha and Te Ao Mārama.

[3] Te Rūnanga o Ngāi Tahu (Declaration of Membership) Order 2001

Partnership

14. The Te Ao Mārama submission sought recognition of the partnership process involved in development of the pORPS (submission point 00223.001). Nothing particular was done to address this point (paragraph 301 of S42A Report Chapter 1), but I observe that the rationale behind the point has been respected with preservation of content and handling of Kāi Tahu submission points that improve upon co-drafted content. The partnership approach has been a very important feature of the process of developing and refining this pORPS. Notably, as outlined by Ms McIntyre and Mr Bathgate in their discussions of the Coastal Environment chapter, a co-drafting approach would benefit that chapter which lacked Kāi Tahu input in the notified version.

Addressing issues of significance

15. The Te Ao Mārama submission point 00223.002, which requests that issues of significance identified by Kāi Tahu are addressed in the pORPS, does not appear to have been specifically referenced in the S42A reports. A table is included in **Appendix 1** that provides a basic scan of the pORPS for coverage of issues of significance to Kāi Tahu. The table is intended to highlight where there are potential gaps in coverage or issues not specifically addressed in provisions or their associated explanations and reasons. Where provisions are identified in the table addressing an issue of significance this should not be interpreted to mean that the provisions are sufficient to address the issue. Not all provisions that address an issue are indicated in the table. Planning witnesses for Kāi Tahu have included recommendations for improvement to many of the provisions that are referenced[4]. The table is therefore a high-level indication of issues that should be recognised and addressed in the pORPS.

16. The table in Appendix 1 shows that there is general coverage of the issues of significance through the pORPS but not complete coverage. Below I set out some examples of the gaps in the pORPS which I consider should be addressed.

17. Kāi Tahu have identified distinct effects of mining activities in the RMIA section, which are not specifically addressed by the pORPS provisions. These issues are discussed to some extent in the evidence of Ms McIntyre[5] and Mr Bathgate[6].

[4] See the appendices to evidence of Ms McIntyre and Mr Bathgate
[5] In the section entitled "Requests of other submitters for special provision for particular categories of economic activity"
[6] In the section on "CE-M4 – District Plans"

18. The pORPS is silent on the matter of long consent durations affecting implementation or achievement of pORPS objectives, although specific guidance is at times provided on consent conditions within pORPS methods (for examples HCV-HH-M5). I consider that this issue of significance is a matter the pORPS could and should provide guidance on, with reference to Section 62(1)(d) and (e) of the RMA. The Section 42A Report Chapter 5 (paragraph 600) mentions long consent durations when discussing amendments to the RMIA section. The Section 42A Chapter 9 briefly discusses long consent durations in the context of the freshwater planning instrument and over-allocation[7]. This matter is best left to further discussion in relation to the freshwater planning instrument. Cross-mixing of waters is another issue of significance not specifically addressed in the pORPS that is best addressed in relation to the freshwater planning instrument.

19. On the matter of the instream effects of dams, this issue of significance is discussed in the section of my evidence "Management of dams and weirs". Lack of specific attention to this issue in the pORPS is, in my opinion, a failure to provide necessary connections between issues, objectives, policies and methods as required by Section 62(1)(d) and (e) of the RMA.

20. On the matter of willow removal, this issue of significance may be addressed generally within pORPS provisions but there is no specific link made to the issue. Willows are highlighted in appendices to the S32 report in relation to the condition of the Cardrona catchment[8] and within the pest and weeds diagram presented to council showing positioning of the issue at the prescriptive end of policy response[9]. The Section 42A Report Chapter 9 discusses the issue within the context of the freshwater planning instrument[10]. This issue is relevant to LF-FW-P14 and LF-LS-M13, which are pORPS provisions addressed in this process rather than the freshwater planning instrument. I consider that opportunity exists to make explicit connection between these provisions and the issue, even if it is simply through amendment to LF-FW-E3 (noting that LF-FW-PR3 is part of the freshwater planning instrument), LF-LS-E4 and LF-LS-PR4. I observe that willows displace indigenous species within the bed and banks of waterbodies and can be invasive, affecting waterbody health and natural character.

[7] Section 42A Report Chapter 9, paragraph 972.
[8] Appendix 6, *Summary of the state of the freshwater environment for the Manuherekia, Arrow, Cardrona and Taieri catchments*, Isaac Bain, Ministry for the Environment, p65
[9] Appendix 3: Phase 1 and 2 consultation summary report, p36
[10] Section 42A Report Chapter 9, paragraphs 525 and 552

21. On the matter of genetic modification, I can understand if this was misinterpreted as a reference to matters best covered by the Hazardous Substances and New Organisms Act 1996. The issue is identified by Kāi Tahu in relation to reduction of mahika kai and biodiversity. I understand the concern to be associated with distinct characteristics of localised populations of flora and fauna which may lose their distinctiveness if mixing occurs with populations outside of their localised area. This issue is relevant to indigenous biodiversity as it is addressed in the Ecosystems and Indigenous Biodiversity and Coastal Environment chapters, which are provisions discussed in the evidence of Mr Bathgate. In addition, I believe there is opportunity to make direct connection to this issue in ECO-E1 and ECO-PR1.

22. There are a number of issues of significance relevant to the Coastal Environment chapter that are not specifically addressed, including cumulative effects, particular matters that generate waste or contaminants in the coastal environment and invasive species. The evidence of Mr Bathgate is focussed on recommended improvements to this chapter. In addition to the matters addressed by Mr Bathgate, in my opinion it is important for the pORPS to be clear about how each of these issues is addressed in the coastal environment provisions given that these issues are identified in accordance with Section 62(1)(b) of the RMA.

23. I note that outside of the RMIA chapter pounamu is only mentioned in APP7 with reference to identifying wāhi tūpuna and in particular ara tāwhito (ancient trails). Provisions addressing wāhi tūpuna apply to areas where pounamu is found. I believe there is opportunity to make direct connection to this issue of significance in HCV-WT-E1 and HCV-WT-PR1. RMIA-PO-I1 identifies extractive activities, reduced water quality and poor water body management as impacting on pounamu as taoka so there is opportunity to make connections with this issue of significance where provisions address earthworks, water quality and management of waterbodies. Within pORPS provisions “taoka” is most often referenced in relation to taoka species, however I note that LF-LS-P22 references wāhi taoka in relation to restricting public access where necessary, which is relevant to management of pounamu. LF-LS-E4 and LF-LS-PR4 are therefore also opportunities to make direct connection to this issue of significance.

WHOLE OF pORPS POINTS

Interim Framework

24. Ngāi Tahu ki Murihiku submission point 00223.003 sought to ensure that an interim framework of provisions provides clear guidance about how to achieve objectives in situations where mapping is intended or targets or limits are required but have not yet been set. This submission point was rejected by Ms Boyd on the basis that in her view the pORPS has already sought to be clear about any interim frameworks (paragraph 355 of Section 42A Report Chapter 1). Ms Boyd also cites reliance on the provisions of the integrated management chapter including the precautionary principle.

25. In my opinion the interim frameworks that apply to provisions requiring mapping or the setting of limits and targets are highly variable. In Table 2 below I have set out the provisions relevant to interim frameworks covered by the Ngāi Tahu ki Murihiku submission point. Within the table I include my notes on the interim frameworks and signal any concerns.

26. The greatest guidance is provided in the Ecosystems and Indigenous Biodiversity chapter which is a good example of how to improve certainty in relation to other provisions in *Table 2*. For example, there is clarity around the nature of case specific assessments required in the absence of mapping and specific reference to the precautionary principle. In my opinion, providing greater clarity and guidance regarding the interim framework will be most important where there are no timeframes to complete mapping or the setting of limits and targets, or where there are later timeframes for completion out to 2028 and 2030. Mapping and the setting of limits or targets can be highly contentious exercises which means further delays in implementation are likely.

27. I recommend that the reporting officers further consider each of these interim frameworks with a view to improving clarity and consistency. Other planning witnesses for Kāi Tahu address the chapters containing these provisions in *Table 2* and incorporate additional recommendations for improvement.

Map/target/limit	Provision	Interim framework
Identifying, recording and assessing places, areas, landscapes, waters, taoka and other elements of cultural, spiritual or traditional significance to them mana whenua	MW-P2 MW-M1	No timeframe to complete the method. MW-P2(3) provides for case by case identification, record and assessment.
Setting ambient air quality limits (by Dec 2024)	AIR-P1, AIR-P2 and AIR-M2	Not specified, but limits to be set within next 13 months
Mapping the landward extent of the coastal environment (by May 2023)	CE-P2 CE-M1	Not specified, but to be mapped within next 6 months
Mapping high and outstanding natural character areas in the coastal environment and their capacity to accommodate change	CE-P4 CE-M2(1)	No timeframe specified. Unclear how these areas will be managed in the absence of mapping and identification of capacity. Likely to be difficult case by case and will require reference to matters in CE-P4, although this does not assist with capacity for change. "Avoid" requirements will apply once identified.
Mapping outstanding natural features, and landscapes and (including seascapes) in the coastal environment	CE-P6 CE-M2(2)	No timeframe specified. Requires reference to APP9. Likely to be difficult case by case to identify. Once identified the "avoid" requirements apply.
Mapping areas of indigenous biodiversity in the coastal environment	CE-P5 CE-M2(3)	No timeframe specified. CE-P5 can assist on case by case basis until mapping occurs.
Mapping areas of deteriorated water quality in the coastal environment and setting water quality targets and limits for water quality in the coastal environment (by Dec 2028)	CE-P3 CE-M3	Reliant on CE-P3 to address water quality in the interim on a case by case basis. CE-M3(4) provides some guidance in the absence of targets or limits. Refer to the evidence of Mr Bathgate for further discussion.
Setting limits on aquaculture activities (by Dec 2028)	CE-P11 CE-M3	Unclear how aquaculture will be managed prior to mapping. May rely on IM-P6. Refer to the

		evidence of Ms Stevens for further discussion.
Mapping surf breaks of national and regional significance (by Dec 2028)	CE-P7 CE-M3	Unclear how these surf breaks will be managed prior to mapping. May rely on IM-P6.
Mapping natural wetlands (by Sept 2030)	LF-FW-P8 (Relevant method in FW planning instrument)	Affects application of LF-FW-P13 and EIT-INF-P13. Wetlands may be identified on a case by case basis in the absence of mapping.
Mapping outstanding waterbodies and identifying their values (by Dec 2023)	LF-FW-P11 LF-FW-P12 LF-FW-M5	Some are already identified in the policy and there is a short timeframe until identification.
Mapping highly productive land (by Oct 2025)	LF-LS-P19LF-LS-M11A	Will have to rely on LF-LS-P19 criteria on case by case basis until mapped.
Mapping significant natural areas and where appropriate indigenous biodiversity (priority areas by Dec 2025 and rest by Dec 2030)	ECO-P2 ECO-P3 ECO-M2	ECO-P3(3) requires adoption of a precautionary approach in accordance with IM-P6(2). ECO-P6 applies. ECO-M2(4) requires ecological assessments with reference to APP2
Identifying indigenous species and ecosystems that are taoka	ECO-P2 ECO-P3 ECO-M3	ECO-P3(3) requires adoption of a precautionary approach in accordance with IM-P6(2). ECO-P6 applies. Can rely on MW-M1.
Provide for existing renewable electricity generation within limits	EIT-EN-M1	No timeframe specified for identification of limits and unclear the specific nature of limits referenced in the method.
Mapping the National Grid and identifying a buffer corridor and mapping significant electricity distribution infrastructure	EIT-INF-P16 EIT-EN-M2	No timeframe specified. Can reference EIT-INF-P16 case by case (noting that this is likely meant to read EIT-INF-P9 in the amended pORPS) as well as EIT-EN-P10.
Commercial port activities to operate within limits set out in policies CE-P3 to P12	EIT-TRAN-P23 EIT-TRAN-M7	Reference CE policies and MAP2.

Mapping the extent of areas subject to natural hazards, and mapping the extent of coastal hazards	HAZ-NH-P1A HAZ-NH-P1 HAZ-NH-M1	No specified timeframe. Reference HAZ-NH-P1 assessment matters, HAZ-NH-P2 and HAZ-NH-P5.
Identifying wāhi tupuna sites	HCV-WT-P1 HCV-WT-M1	No specified timeframe. Case by case assessment provided for with reference to APP7. Can also reference MW-M1.
Mapping outstanding and highly valued natural features and landscapes outside of the coastal environment	NFL-P1 NFL-M1	No specified timeframe. As per CE-M2, case by case assessment provided for with reference to APP9, although this does not assist with assessing capacity to accommodate change. Refer to the evidence of Mr Bathgate for discussion of issues with the concept of "capacity". Once identified "avoid" policies apply.
Limits on urban expansion (by 2024 LTP)	UFD-P4	Provides for application of short term, medium term, intermediate or temporary limits

Table 2: Provisions reliant on mapping or the setting of limits and targets

Management of dams and weirs

28. Ngāi Tahu ki Murihiku submission point 00223.005 addresses the management of dams and weirs. The Section 42A Report (Chapter 9, paragraph 64) briefly addresses the point and leaves it open for further evidence. The Section 42A Report (Chapter 12, paragraph 19) recommends an improved definition of "hard protection structure" based on the submissions of Ngāi Tahu ki Murihiku and Forest and Bird. The amended definition does not adopt the request of Forest and Bird to introduce the notion of "primary purpose" or narrow the definition to flooding risk mitigation. In the absence of those two elements of the Forest and Bird submission a dam need not have the primary purpose of natural hazard risk mitigation to qualify as a hard protection structure and simply needs to identify that it has been "specifically established for the purpose" of natural hazard mitigation, so long as that forms one of the purposes of the protection structure. A dam may therefore have other purposes, such as irrigation, but may also

be identified as a means of mitigating fire risk, for instance. Within the Section 42A Report (Chapter 12, paragraph 208) Mr Adams asserts that the definition of hard protection structure is limited to flood hazard mitigation but that does not accord with the Section 42A and Supplementary Evidence version of the pORPS.

29. To ensure there is no doubt regarding purpose I recommend that the definition of "hard protection structure" is amended in line with the Forest and Bird reference to "primary purpose" as follows:

> … outside the coastal environment, means any kind of structure ~~which is specifically established for the~~ that has the primary purpose of natural hazard risk mitigation, including: any dams, weirs, stopbanks, carriageways, groynes, or reservoirs.

30. I note that HAZ-NH-P7 provides for hard protection structures as natural hazard risk mitigation only in limited circumstances. In drier areas there may not be a reasonable alternative to a dam for providing water for fire-fighting, which would satisfy this policy. As long as the dam does not increase natural hazard risk or displace risk, and the adverse effects of the dam can be adequately managed, then this also satisfies the policy. In my opinion, the policy does not set a particularly high bar with use of the phrase "adequately managed". HAZ-NH-M3 and HAZ-NH-M4 then require that local authorities must prepare or amend and maintain their plans to provide for hard protection structures in accordance with HAZ-NH-P7. No further guidance is given regarding how to provide for them, aside from following the policy.

31. It is still not clear to me after reading the Section 42A Report, that the Otago Regional Council intends for plans in the region to specifically enable dams for fire-fighting in drier areas as a means of natural hazard risk mitigation. If this is the intended policy direction then this has implications for the establishment and management of dams in accordance with the Land and Freshwater chapter. That chapter does not make any specific reference to dams and their management. There is undoubtedly a water quantity component to dams, whether they are instream or out of stream, but also other relevant matters such as natural character, form and function, water quality, fish passage, indigenous biodiversity and habitat, sediment transport, coastal processes etc depending on whether a dam is instream or out of stream. The pORPS leaves all of these aspects of management of dams and weirs to the general provisions in the Land and Freshwater, Coastal Environment, Ecosystems and Indigenous Biodiversity, and Energy and Infrastructure chapters.

32. The Section 32 report mentions dams twice, once in relation to water quantity (paragraph 361) and once in relation to energy infrastructure (paragraph 467). Within the appendices to the Section 32 report dams are referenced in the 2019 Skelton report[11], the history of regulation[12], the summary of particular Central Otago catchments[13], the summary report of the reference groups that were part of reviewing the regional policy statement[14], and the consultation report on long term visions[15]. Dams are a significant feature of the existing landscape of resource management in Otago and are regularly highlighted by mana whenua, including in the RMIA chapter, as causing concern. Both existing dam infrastructure and new dam infrastructure will require management over the life of the pORPS. Some dams will fall into the categories of nationally significant or regionally significant infrastructure and will therefore be managed in accordance with those provisions. My understanding of the consequence of the current approach in the pORPS is that key decisions about the framework to manage dams, including with reference to their purpose, will be left to the regional plans and district plans. The pORPS is almost entirely silent on those points.

33. I struggle with accepting that the pORPS has so little to say about such a significant resource management issue for the region. The Ngāi Tahu ki Murihiku submission suggested more discussion in explanations and principal reasons of relevant chapters to make the expectations or linkages more obvious in relation to dams. I consider that this would be a helpful addition to the pORPS and at this point I would also consider it the minimum necessary to appropriately address the Ngāi Tahu ki Murihiku submission point and meet the requirements of Section 62 of the RMA.

Wāhi Tūpuna

34. The Wāhi Tūpuna chapter provisions are further discussed in the evidence of Mr Bathgate. I confine my evidence to addressing the overarching Ngāi Tahu ki Murihiku submission point 00223.006 and related points. In general, through pre-hearing meetings and supplementary evidence the core tension that the submission was

[11] *Investigation of Freshwater Management and Allocation Functions at Otago Regional Council – report to the Minister for the Environment*, Professor Skelton, 1 October 2019
[12] *History of regulation – the Otago mining privileges*, Robert McClean, Ministry for the Environment
[13] *Summary of the state of the freshwater environment for the Manuherekia, Arrow, Cardrona and Taieri catchments*, Isaac Bain, Ministry for the Environment
[14] *Otago Regional Council Regional Policy Statement Review: Reference Groups Summary Report*, August 21 2020, ORC Strategy and Policy Committee
[15] *Consultation report: RPS long-term visions for fresh water - October-November 2020,* James Adams, January 2021

addressing has been largely resolved. Ngāi Tahu ki Murihiku have developed a methodology to assess cultural landscapes that does not rely on mapping and is not limited to a reference list of features[16]. The intent of the submission point was to ensure that this methodology would be able to be employed in Otago. This was expressed in the submission as follows:

"*Ngā Rūnanga are principally concerned with the different methods that may be employed to identify wāhi tūpuna through planning instruments and decision-making processes, and wish to ensure there is no confusion regarding interpretation of cultural landscapes or wāhi tūpuna in practice, and that ngā Rūnanga expression of cultural landscapes is accommodated."*

35. Three references to cultural landscapes are retained in the pORPS: RMIA-AA-I1, RMIA-CE-I5, and APP9. By contrast, the Air and Atmosphere policy provisions that address RMIA-AA-I1 reference wāhi tūpuna (AIR-P6). This is also true in the Coastal Environment chapter method that addresses RMIA-CE-I5 (CE-M3). APP7 which is referenced when identifying wāhi tūpuna makes it clear that the listed elements are not complete and that they are part of a wider cultural setting. The definition of wāhi tūpuna was accepted in submission and has been incorporated into the introductory text of APP7 in response to submission point 00223.135. HCV-WT-M1 now makes it clear that mapping is just one method to identify, record and protect wāhi tūpuna in response to submission point 00223.121. MW-M1 also supports use of methodology that accords with tikaka, kawa and mātauraka. At present APP9 appears to be anomalous as it retains reference to cultural landscapes within the associative attributes. I recommend that this be amended to reference wāhi tūpuna so that all the pORPS provisions are consistently using the term wāhi tūpuna when addressing issues associated with cultural landscapes.

36. A "purist" approach, in terms of relying on assessment by Kāi Tahu using indigenous methodologies rather than a cultural values assessment as part of non-indigenous methodologies, was requested in Ngāi Tahu ki Murihiku submission points 00223.089 and 00223.136 addressing the identification of outstanding water bodies and outstanding and highly valued natural features and landscapes (including seascapes). I understand the rationale to be that APP7, HCV-WT-M1 and MW-M1 provide for identification of Kāi Tahu values by Kāi Tahu, using Kāi Tahu methodologies, with a high degree of cultural integrity in relation to any particular area or feature. Such

[16] *Āpiti Hono Tātai Hono: Ngā Whenua o Ngāi Tahu ki Murihiku Stage 1 of the Southland Cultural Landscape Assessment Study* 2021

assessments provide a lens through which to view an area or feature and may also provide a visual layer over a mapped area. It is expected that there will be a high degree of overlap between outstanding water bodies and outstanding and highly valued natural features and landscapes (including seascapes) and wāhi tūpuna. Assessments of wāhi tūpuna could therefore provide what is needed to understand the Kāi Tahu values associated with an outstanding water body or outstanding or highly valued natural feature or landscape. In essence, this remains true when the associative attribute is retained in APP9. A wāhi tūpuna assessment can inform the attribute.

37. At its heart, this issue comes down to who is undertaking the assessment of Kāi Tahu values, using what method and in what context. A natural features and landscapes assessment is approaching the question of value from a different starting point than a wāhi tūpuna assessment. A wāhi tūpuna assessment ensures Kāi Tahu agency and enables an appropriate expression of rakatirataka and kaitiakitaka in the process. Where separate assessments are undertaken for the same area using different methodologies for a different purpose it then becomes a matter of how the planning framework addresses the relationship between wāhi tūpuna, outstanding water bodies and outstanding and highly valued natural features and landscapes (including seascapes). For instance, the wāhi tūpuna assessment may identify important cultural uses associated with an area which may also be an area assessed as an outstanding water body or outstanding or highly valued natural feature or landscape. Provisions governing the outstanding water body or outstanding or highly valued natural feature or landscape could then enable customary use of the water body, natural feature or landscape (e.g. with reference to MW-P3, MW-P4, CE-P13 and LF-WAI-P2), or alternatively, if poorly drafted could interfere with customary use. Retaining the associative attribute in APP9 provides an avenue for use of MW-M1 to address the attribute. Using the term wāhi tūpuna to replace the term cultural landscape in APP9 would also provide a soft connection to APP7 and HCV-WT-M1. I note that it is always most appropriate for Kāi Tahu to be identifying Kāi Tahu values where such as assessment is provided for in provisions.

38. Other than my recommendation at paragraph 25 above in relation to APP9, I am satisfied that nothing further is required to address the matters raised regarding wāhi tūpuna in the Ngāi Tahu ki Murihiku submission.

RELATIONSHIP WITH CAIN WHĀNAU SUBMISSION AND EVIDENCE

39. Ngāi Tahu ki Murihiku lodged a further submission in general support of the Cain whānau submission, while signalling that some modification would be needed to the recommended amendments. The Cain whānau, Te Rūnanga o Ngāi Tahu, Aukaha and Te Ao Mārama have participated in discussions to improve the definitions of papakāika or papakāinga and Māori land, MW-P4, MW-M1 and MW-M5. I understand that the Cain whānau may be seeking further improvements, in particular in relation to MW-P4 and MW-M5 when it comes to the matter of primacy. I can appreciate the reasons for the Cain whānau submission seeking primacy.

40. There is a long history of limitations being placed on native reserves and Māori land, as in the case of Maranuku (the land referred to in the Cain whānau submission), that have prevented utilisation[17] of these lands for the well-being of whānau. That history is also commented on in the cultural evidence. I support resolution of this matter in a manner that provides an enabling framework for utilisation of native reserves and Māori land with barriers reduced to allow for the fullest possible expression of rakatirataka or self-determination. I consider this an appropriate approach because of the long history of regulatory barriers to utilisation of native reserves and Māori land and the scarcity of such land in the Otago region. Native reserves and Māori land make up a tiny fraction of all land in the region. In my opinion, enabling, and as far as possible prioritising, utilisation of native reserves and Māori land is a necessary means of implementing MW-O1.

41. I am aware that other planning witnesses in the Kāi Tahu suite of evidence have considered wording changes in light of the Cain whānau submission. I have thought about alternative expressions that pick up on the purpose for the Cain whānau recommendation regarding primacy. I have discussed options with Kāi Tahu planning witnesses and Mr Farrell who is acting as planning witness for the Cain whānau. My preference is to view the Cain whānau evidence in relation to amendments to MW-P4 and MW-P5 that may satisfy their point.

42. In my opinion lack of prioritisation, as far as possible, for Kāi Tahu utilisation is likely to result in constraints that arise precisely because native reserves and Māori land have faced historic barriers to development. I consider that there is a significant risk that any “untouched” characteristics of these areas will have the effect of preventing or unduly inhibiting utilisation of native reserves and Māori land that could benefit whānau

[17] “Utilisation” in this section of my evidence is used as a short-hand term for “subdivision, use and development”

well-being. Ms McIntyre has provided wording in MW-P5 that enables Kāi Tahu to take the lead in approaches to managing adverse effects on the environment associated with activities on native reserves and Māori land. This provides for a degree of empowerment, whakamanahia, consistent with rakatirataka. My understanding is that rakatirataka is a fundamental Treaty principle, inherent in partnership, and therefore introduction of this ability to lead is a means of giving effect to that principle.

43. In these particular circumstances what is valued by mana whenua is the land they hold and the potential for it to provide for whānau well-being through utilisation. MW-O1 requires that what is valued by mana whenua is actively protected. In my view what is to be actively protected is the value of the land to mana whenua in terms of ability to manifest ahi kā, which describes the ability of mana whenua to stay on their land, making a living and tending the place as kaitiaki. Given the scale of land loss and deprivation that mana whenua have endured, as identified in the Ngāi Tahu Report 1991[18] and referenced in cultural evidence, I understand that ahi kā is highly valued on the remnants of native reserves and Māori land that remain in the hands of mana whenua.

44. I am aware of the findings of the Ngāi Tahu Sea Fisheries Report 1992[19] regarding the development rights of Kāi Tahu, which states that "inherent in the Treaty of Waitangi is a right to development". Quoting the Muriwhenua tribunal this report records that "the Treaty offered a better life for both parties". Much of the discussion around the development right in the report is focussed on the notion that Kāi Tahu should not be "frozen in time", which would hold the tribe back, creating an imbalance in the Treaty partnership in terms of ability to progress. The situation being assessed by the Waitangi Tribunal in the fisheries report was that Kāi Tahu were prevented from actively developing their fisheries from the late 1860s onwards[20]. Where there have been barriers to development of native reserves and Māori land my interpretation is that this is precisely what has happened to the owners of that land, they have been "frozen in time". In my opinion, the pORPS represents a significant opportunity to unlock native reserves and Māori land in a way that will enable the beneficial owners of the land to truly benefit from their land, in direct connection with that land, and in fulfilment of the mutual benefit proposition inherent in Te Tiriti o Waitangi.

[18] The Ngai Tahu Report 1991
[19] The Ngai Tahu Sea Fisheries Report1992, section 10.2
[20] Ibid, p257

45. Other planning witnesses for Kāi Tahu address these matters in MW-P4, MW-M5 and chapter specific provisions. I anticipate that Cain whānau evidence will address these matters which may provide for further improvements that advance prioritisation, as far as possible, for utilisation of native reserves and Māori land.

RESPONSE TO SECTION 42A REPORTS AND SUPPLEMENTARY EVIDENCE

SECTION42A - CHAPTER 1 AND SUPPLEMENTARY

Land-based Primary Production

46. Ngāi Tahu ki Murihiku support for provisions that assist with a coordinated response to climate change is recorded at paragraph 22 of the Te Ao Mārama submission. The need for an integrated climate change response that considers adaptation and mitigation, relevant to all facets of resource management, is cited as a reason for Ngāi Tahu ki Murihiku supporting retention of provisions in the integrated management chapter (submission point 00223.053). Ngāi Tahu ki Murihiku made a general submission point on the LF-LS chapter recorded in the summary of decisions requested as 00223.094. Establishment of permanent carbon forestry is of particular interest to Ngāi Tahu ki Murihiku (refer to paragraph 14 in the evidence of Evelyn Cook).

47. I do not support the analysis of Ms Boyd in the second supplementary evidence statement of 21 October 2022 on the Land and Freshwater chapter in which she recommends adopting the definition of "land based primary production" from the National Policy Statement for Highly Productive Land (NPSHPL), in preference to an alternative definition for "food and fibre production". In particular, at paragraph 33 Ms Boyd reasons that the NPSHPL does not explicitly state that local authorities may adopt more stringent measures than those in the NPSHL, and identifies that excluding permanent carbon forestry from prioritisation on highly productive land is a more stringent measure. Ms Boyd relies upon clause 3.1 and a general obligation to give effect to the objective of the NPSHPL.

48. I note that Section 45A(2) of the RMA contains a list of matters that a national policy statement may state, including at (b) *"constraints or limits on the content of policy statements or plans".* The matter of stringency is more appropriately applied in relation to a national environmental standard. I do not find a particular constraint applied in the NPSHPL that would prevent differentiation of forestry types on highly productive land.

49. I note the following passage from page 31 of the Section 32 evaluation of the NPSHPL:

> *"The use of the term 'land-based primary production' and the associated link to activities that are dependent on the soil resource of the land is intended to recognise that while the NPS-HPL protects 'HPL' for land-based primary production, councils retain the discretion over what type of land-based primary production can occur on what type of HPL, including forestry. This gives councils the ability to address concerns about forestry – if forestry is considered an unsuitable use for a particular piece of HPL, it can still be restricted."*

50. Further, on page 95 of that evaluation:

> *"While forestry may not be the most productive use of HPL, there is no strong evidence that large areas of HPL are being converted to forestry and that this presents a risk to the overall HPL resource at a regional or national scale. While the forestry cycle takes place over a longer timeframe (approximately 30 years), it is not irreversible to the same extent as urban rezoning/development and fragmentation into lifestyle lots. Therefore, plantation forestry on HPL can be converted to other more productive primary sector uses over time.*
>
> *The Resource Management (National Environmental Standard for Plantation Forestry) Regulations 2017 (NES-PF) permits afforestation for plantation forestry in many areas of the country. However, councils retain the ability to make rules for activities or effects that are out of scope of the NES-PF. Existing guidance on the NES-PF confirms councils can make rules to manage activities that are out of scope (such as permanent forestry) or effects such as water yield. If forestry, or a particular type of forestry, poses a risk to HPL resources in a region, a council could likely make rules to limit afforestation as the protection of HPL is out of the scope of the NES-PF. The Government is also considering changes to the NES-PF to better manage both plantation forestry and permanent forestry which may include controls for forestry activities on HPL."*

51. In this Section 32 analysis it is clear to me that Council discretion is retained regarding types of land-based primary production on highly productive land. A key matter for concern in the analysis is whether an activity on highly productive land is readily reversible.

52. In my opinion, there is an available path for the Council to differentiate harvested forests from permanent carbon forests on highly productive land as the Section 42A author was attempting to do in offering an alternative definition for "food and fibre production". This does not interfere with giving effect to the NPSHPL objective. Highly productive land will still be protected for land-based primary production but not necessarily for every kind of land-based primary production. A permanent forest planted with no intention of harvest, whilst ostensibly reversible, is intended to be permanent. The effect of this is to lock up land that might otherwise be used for

different land-based primary production activities. The council may determine that permanent forestry on highly productive land is not a priority use for this limited and valued resource in the region.

53. The recommendation of Ms Boyd to adopt the NPSHPL definition of land-based primary production could instead be replicated and adjusted to add a final clause to the definition "…, excluding permanent forestry." This would indicate how the council intends to implement the NPSHPL in Otago and specifically which land-based primary production activities will be prioritised on highly productive land. Such a change would not prevent establishment of indigenous plantings on highly productive land that may support a range of objectives in the pORPS, or harvested plantation forestry, but would explicitly exclude permanent forestry from prioritisation on highly productive land.

54. I support the recommendations of the Section 42A report (chapter 1, at paragraph 194) which differentiate permanent forestry from plantation forestry that is planted and re-planted.

55. I leave any further discussion of the NPSHPL and its implications to the other planning witnesses for Kāi Tahu. Refer in particular to the evidence of Ms McIntyre.

Environmental limit

56. I support the approach as outlined in supplementary evidence, to use the term "limit" to "environment limit" and the majority of recommended amendments in Appendix 1 to the Chapter 1 supplementary evidence, although there appear to be some typographical errors. In Appendix 1, with reference to the SRMR Introduction, the ORC analysis indicates a preference for use of the word 'constraints' rather than 'limits' in this context, which I support as a helpful amendment that assists meaning, however I note that the recommended amendment column still refers to 'limits' which appears to be in error. Also, in Appendix 1 in relation to the IM-P12 recommended amendment it should read 'a limit' rather than 'an limit'. I support the positions of Mr Bathgate regarding CE-O5 and CE-M3 in his evidence.

57. Where there are additional changes proposed to provisions (e.g. IM-P14), I do not necessarily support these. I support the evidence of Ms McIntyre in relation to recommended amendments to the Integrated Management chapter.

Habitat of Trout and Salmon

58. On behalf of Te Ao Mārama I contributed to pre-hearing discussions with ORC, the Department of Conservation and Fish & Game about resolution of the matters raised in Fish & Game's submission[21] regarding species interactions between salmonids and indigenous species. The drafting that has been recommended by the Section 42A reporting officer is the result of that collaborative effort to provide appropriate direction in the pORPS on this significant issue. In the process of drafting we were mindful of implementation requirements within the NPS-FM and the statutory roles of each party relevant to addressing the issue. I support the Section 32AA evaluation of these amendments.

59. Refer to the evidence of Evelyn Cook at paragraph 22 regarding the significance of addressing this issue for achieving outcomes sought by Ngāi Tahu ki Murihiku for indigenous species and mahika kai.

"Control" and "Manage"

60. As identified in the supplementary evidence (Chapter 1, paragraph 44), use of the terms "control" and "manage" in the pROPS was not specifically addressed in submissions but is relevant to the overarching submission point 223.002 of Ngāi Tahu ki Murihiku regarding policy direction in relation to issues of significance identified by Kāi Tahu. It is important that terminology is used consistently to aid interpretation of policy direction and intent. I support the recommended amendments of the Section 42A author as I consider that "manage" is the appropriate term to use with reference to clearance or modification of indigenous vegetation (ECO-M4 and ECO-M5) that allows for a range of approaches, including control, whereas "control" is the term with appropriate specificity in reference to wilding conifer spread.

Effects management hierarchy

61. Ngāi Tahu ki Murihiku submitted to retain the effects management hierarchy definition as it pertained to wetlands (submission point 00223.018). Kāi Tahu ki Otago also opposed submissions of some other parties requesting amendment of this definition (further submission point FS00226.260) or inclusion of a definition and provisions that would apply effects management hierarchies more broadly across the pORPS (further

[21] Our further submission point 00231.05 and consistent with the reasons for Ngāi Tahu ki Murihiku submission in paragraph 12 of the Te Ao Mārama submission, as well as addressing taoka species and habitats as a resource of significance to Kāi Tahu (p63 of the pORPS).

submission points FS00226.003 and FS00226.341). In response to the submissions of other parties and further consideration by Ms Boyd, this has been replaced with the new definition for "Effects management hierarchy (in relation to natural wetlands and rivers)" which references the hierarchy in new policy LF-FW-P13A.

62. I do not agree with the proposed additional definition for "effects management hierarchy" which I consider to be both too broad in application and too vaguely defined to be of any practical use. At paragraph 221 of the Section 42A Report (Chapter 1) Ms Boyd references an effects management hierarchy as "a particular sequence of management actions" or otherwise "management steps". In each instance where a hierarchy of management actions is present there is a first action or step that requires avoidance. Ms Boyd has identified where there are such hierarchies present in provisions, outside of those in ECO-P6 or LF-FW-P13A, although these do not reference the term effects management hierarchy. I cannot see a purpose for the proposed definition of "effects management hierarchy" which does not appear anywhere else outside the interpretation section, except in reference to ECO-P6 or LF-FW-P13A. I support differentiating the two effects management hierarchies in the ECO and LF-FW chapters, which is already accomplished with the two new definitions and associated policies. The nature of each effects management hierarchy is clear from the text in ECO-P6 and LF-FW-P13A that outlines a sequence of management actions or steps such that "effects management hierarchy" as a phrase is readily understood in each context. No separate definition is needed.

63. The Ngāi Tahu ki Murihiku submission suggested introducing effects management hierarchies in additional provisions relating to infrastructure, generally where the term "minimise" is used following reference to first employing avoidance. I understand the reason for the requested amendments relates to the need for additional clarity around expected management actions or steps where adverse effects cannot be avoided. Planning evidence on the infrastructure chapter provisions is provided by Sandra McIntyre as part of the suite of Kāi Tahu evidence and is not further addressed in my evidence. For that reason, I will only briefly address these submission points here.

64. I understand the term "minimise" to have an ordinary meaning in the context of these provisions, such as the New Zealand Oxford Dictionary definition *"reduce to the smallest possible amount or degree*". I accept the rationale for rejection of submission point 00223.105 in relation to EIT-EN-P4. I do not follow the rationale for rejection of submission point 00223.107 in relation to EIT-INF-P11 but understand that the Section 42A author favours continued reliance on the term "minimise". I note that at paragraph

697 of the Section 42A Report (Chapter 11) regarding EIT-INF-P13 Ms Boyd identifies that "minimise" can encompass the options of remedy, mitigate, offset or compensate or at least does not prevent these management actions from being employed as part of minimising effects. In my opinion, reliance on the term "minimise" simply lacks specificity or clarity as to which particular management actions to employ and in what sequence, or in fact whether particular management actions are available to be employed. This would appear to leave the matter to a case by case assessment of available options for action, within an overarching requirement to reduce adverse effects to the smallest possible amount or degree. I accept the approach taken by Ms Boyd to the Ngāi Tahu ki Murihiku submission points, including 00223.110 in relation to EIT-INF-M4(2) and 00223.111 in relation to EIT-INF-M5(7). Any further discussion of improvement to these provisions associated with the Ngāi Tahu suite of evidence and the submission points of Kāi Tahu ki Otago I leave to Ms McIntyre.

65. I support the recommendation of Mr Bathgate with regard to application of an effects management hierarchy in the coastal environment within his evidence.

SECTION 42A CHAPTER 2 AND SUPPLEMENTARY

Part One – Intro & General

Foreword or mihi

66. The Council's response to the submission point by Jim Hopkins 004200.004 has resulted in the phrasing: *"Mana whenua, the community and ORC …"*. I support the inclusion of reference to community as an important addition to correct a drafting oversight. However, the chosen phrasing has the unintended consequence of appearing to separate mana whenua from the community at large. Mana whenua are part of the community (both as that word is commonly understood, and by reference to rights under Article 3 of Te Tiriti), as well as having distinct rights in relation to their taoka katoa (with reference to Article 2 of Te Tiriti). This has been resolved elsewhere in the pORPS by more inclusive phrasing, such as: *"…the community, including mana whenua, …"*. For example, in response to Kāi Tahu ki Otago submission points 00226.111 and 00226.112 in relation to IM-AER2 and IM-AER3. Similar phrasing would be more appropriate in the foreword or mihi in line with the reasons at paragraph 12 of the Te Ao Mārama submission as it better reflects the rights and interests of

mana whenua. This also better reflects the key issues identified by Kāi Tahu on page 12 of the pORPS[22]. Refer to the evidence of Evelyn Cook at paragraph 11.

Purpose

67. The Section 42A Report (Chapter 2, paragraph 35) recommends amendment to the purpose statement in response to Federated Farmers submission point 00239.002 to acknowledge that the Otago RPS promotes a thriving and healthy natural environment as being vital to sustaining our wellbeing. This amendment is consistent with Ngāi Tahu ki Murihiku reasons for submission at paragraph 13 of the Te Ao Mārama submission. Mātauraka of Kāi Tahu relevant to this point is captured in the whakataukī: Toitū te marae o Tāne, toitū te marae o Tangaroa, toitū te iwi[23]. In essence this whakataukī describes the foundation of Kāi Tahu resource management which is based on the understanding that looking after the natural environment, protecting mauri, is about providing for hauora, the health and well-being of the natural environment and of people, in perpetual relationship. Environmental degradation is therefore correlated with harm to the health and well-being of people, and particularly mana whenua where cultural identity, association and practice is dependent upon access to natural environment and resources in a healthy state. Refer to the evidence of Evelyn Cook at paragraphs 17 and 18.

Description of the Region

68. At paragraph 51 of the Section 42A report (Chapter 2) the Ngāi Tahu ki Murihiku submission point 00223.009 regarding proposed amendments to the description of the region is discussed and rejected. I accept the ORC reasoning that the general overview is not intended to identify specific places. However, I note the submission point was seeking that a reference be considered within the coast and natural character sections. Both the ORC reasoning and the purpose of the submission point can be accommodated in the following way by amending the second sentence under the Coast heading:

> Working farms abut most of the coastline, while remnant swathes of native bush clad coastline are a distinct feature of the Catlins area. Significant coastal settlements include Dunedin and Ōamaru.

[22] Section 42A and supplementary evidence version, first bullet point, which is not subject to any submissions recommending amendment.
[23] Refer to Section 1.2, p24 and p172 of *Te Tangi a Tauira*

69. Such an amendment supports the reason for the submission point, highlighting what is distinctly different about this area of coastline compared to much of Otago. In that way it is consistent with the overview approach and is highlighting what makes this part of Otago particularly notable, not just scenically but in relation to coastal character and condition. This distinctive feature of the Catlins is also what increases its cultural significance to Ngāi Tahu ki Murihiku. Whānau can trust their ability to access healthy mahika kai adjacent to areas of coastline covered in native vegetation at the coast and up the catchment, ki uta ki tai. These are areas favoured by mana whenua within the Statutory Acknowledgement Area of Te Tai o Arai Te Uru (Coastal Marine Area). Refer to the evidence of Evelyn Cook at paragraph 13. The importance of highlighting this distinction is that it signals early within the pORPS what is unique to the Catlins as an area of Otago, warranting particular attention in implementing the framework of the regional policy statement. This is similar to the purpose of highlighting the two major urban areas on the coast as they interact with coastal character and condition, or highlighting farms as a feature of the coastal environment for the same reason. Within Otago, the Catlins area is notable for its extent of indigenous forest and vegetative cover along the coastline.

70. Through the supplementary evidence of Ms Hawkins (Section 42A Chapter 2 supplementary evidence, paragraph 6) and Ms Fenemor (Section 42A Chapter 13 supplementary evidence, paragraph 8) a new introductory sentence has been proposed for this section, the purpose of which is supported. However, it is not appropriate to refer to 'Kāi Tahu' in this context as the early exploration and occupation of the area was not by Kāi Tahu but by Waitaha and later Kāti Māmoe tūpuna, so it may be best to refer to Māori generally in this instance. Making such an amendment would honour a partnership approach to drafting, in accordance with submission point 00223.001, particularly where Kāi Tahu are referenced.

How the policy statement works

71. I observe that the ORC response to submission point 00509.013 of Wise Response improves upon the Ngāi Tahu ki Murihiku submission point 00223.015 and appropriately recognises the reason for that submission point, as discussed in paragraph 107 of the Section 42A report (Chapter 2). That amendment is supported.

SECTION 42A CHAPTER 8 AND SUPPLEMENTARY

Coastal environment

72. The evidence of Mr Bathgate comprehensively addresses relevant issues in the Coastal Environment chapter with reference to Ngāi Tahu ki Murihiku submission points. I limit my commentary to submission point 00223.071 which has not been discussed in the Section 42A Report (Chapter 8), although it is referenced, and is not further discussed in the evidence of Mr Bathgate. The submission point highlights a problem with CE-P6(4) which, following Section 42A reports and supplementary evidence, reads as follows:

> *Protect natural features, and landscapes (including seascapes) in the coastal environment by:*
>
> *(4) promoting restoration or enhancement of natural features, and landscapes (including seascapes) where they have been reduced or lost.*

73. The submission requested that the phrase "where they have been reduced or lost" be replaced with "in order to achieve Objective CE-O1." The reasons for the submission point included the following text:

> *The existing wording does not make sense as it is difficult to understand how a landscape or seascape is reduced or lost.*

74. The problem remains in the current drafting. How is a landscape or seascape reduced or lost? I can imagine how a natural feature might be reduced, but if it is lost then the feature is no longer present. It is likely that what is meant here is a reduction or loss of values associated with the natural feature, landscape or seascape. If the proffered solution of Ngāi Tahu ki Murihiku is adopted, then with reference to the evidence of Mr Bathgate, CE-P6(4) should be amended as follows:

> *"… ~~where they have been reduced or lost~~ in order to achieve Objectives CE-O1 and CE-O2."*

75. However, if I am correct that what is meant is a reduction or loss of values, then this should be specified and CE-P6(4) amended as follows:

> *"… where ~~they~~ their values have been reduced or lost."*

SECTION 42A CHAPTER 10 AND SUPPLEMENTARY

Ecosystems and Indigenous Biodiversity

76. The evidence of Mr Bathgate addresses relevant issues in the Ecosystems and Indigenous Biodiversity chapter with reference to Ngāi Tahu ki Murihiku submission points. My evidence addresses Ngāi Tahu ki Murihiku submission point 00223.134 with respect to the relationship of biodiversity offsetting provisions with mānuka and kānuka. This submission point was not discussed during pre-hearing meetings as the agenda for discussion of the Ecosystems and Indigenous Biodiversity chapter was very full and Ngāi Tahu ki Murihiku were the only submitter on this point. This point is discussed at paragraph 579 of the Section 42A Report (Chapter 10) where Ms Hardiman correctly identifies that there is an error in the submission point. The reasons for the submission point reference both mānuka and kānuka and so any amendment would need to be to APP3(1)(a) and (b).

77. In rejecting the submission point Ms Hardiman references ecological advice regarding the Threatened status of kānuka and the At Risk-Declining status of mānuka, both of which are dependent upon the threat of myrtle rust. This threat is not considered by Ms Hardiman, in light of ecological advice, to be currently relevant in the Otago region. Ms Hardiman does not discuss the status of mānuka and kānuka as taonga species under the Ngāi Tahu Claims Settlement Act 1998. I refer to **Appendix 2** which includes a literature review to assist decision-makers with understanding of mānuka and kānuka as taoka and provide context in relation to the rationale of Ms Hardiman for rejecting the submission point. This review was undertaken by Kitson Consulting Limited on behalf of Te Ao Mārama by Rata Pryor-Rodgers who is currently on maternity leave.

78. I note that both IM-P12 and ECO-P6 reference APP3. Biodiversity offsetting is enabled only for residual adverse effects after avoidance, remediation and mitigation. Biodiversity offsetting is not available for loss of individuals of Threatened taxa or measurable loss within an ecological district of an At Risk-Declining taxon, with the exception of mānuka and kānuka. In circumstances where biodiversity offsetting is available, a number of criteria must be met (APP3(2)) and further matters addressed in a resource consent application, including consideration of mātauraka Māori (APP3(3)).

79. I observe that mātauraka Māori incorporates the understanding that mānuka and kānuka are taoka species. In terms of ECO-M3, some taoka species have already

been identified through the Treaty Settlement process and recorded in the Ngāi Tahu Claims Settlement Act 1998, Schedule 97. ECO-P8 requires that the "*extent, occupancy and condition of Otago's indigenous biodiversity is increased by restoring and enhancing habitat for indigenous species, including taoka and mahika kai species*". APP3(2)(b) is inconsistent with the requirement in ECO-P8 to increase biodiversity as "no net loss" does not equate to an increase, although "a net gain" should result in an increase, and therefore a net gain is necessary where these taoka species are impacted by biodiversity offsetting.

80. The effects management hierarchy in ECO-P6 and APP3 apply outside of the coastal environment. In accordance with ECO-P7, ECO-P6 does not apply within the coastal environment, and therefore APP3 does not apply within the coastal environment unless IM-P12 is relevant in the context of climate change mitigation activities. A climate change mitigation activity may conceivably include establishment of forestry within the coastal environment, which may also conceivably involve clearance of mānuka and kānuka. ECO-P8 applies within the coastal environment as it is not specifically excluded by ECO-P7 so the matter of a requirement for net gain is true both within and outside the coastal environment. If mānuka and kānuka exceptions are to be retained in APP3(1), then APP3(2) must be amended to require a net gain where biodiversity offsetting is applied in situations that impact on mānuka and kānuka.

81. ECO-P2 applies both within and outside the coastal environment and requires that, where appropriate (including in accordance with tikaka as per submission point 00226.218 of Kāi Tahu ki Otago), indigenous species and ecosystems that are taoka in accordance with ECO–M3 are identified and mapped. Some identification and mapping of mānuka and kānuka has occurred as part of the pORPS process. MW-M1(1) also applies and requires identifying, recording and assessing taoka using methods determined by mana whenua, as well as protecting the values of taoka. This supports MW-P2 which requires that the relationship of Kāi Tahu with taoka is recognised and provided for as local authorities exercise their functions and powers. I consider that biodiversity offsetting of mānuka and kānuka requires application of MW-M1 in order to satisfy APP3(3)(e). In a particular circumstance this would enable Kāi Tahu to appropriately assess, according to tikaka, kawa and mātauraka, how to manage the taoka species affected by a proposed activity. I note that mere "consideration of mātauraka Māori" in APP3(3)(e) does not reflect the requirement under MW-P2 to recognise and provide for the relationship of Kāi Tahu with taoka species, whereas "application of mātauraka Māori" would accomplish appropriate

recognition and provision, as would "incorporation of mātauraka Māori" if that is preferred. This would accord with ECO-P1, CE-P13, IM-P3, IM-P6 MW-P3 and MW-M2. I recommend that APP3(3)(e) be amended as follows:

"…include ~~consideration~~ application of mātauraka Māori, and …"

82. I believe the proposed amendment to be within scope of the Ngāi Tahu ki Murihiku submission as it relates to MW-P3 (submission point 00223.030 and the reason for that submission) and resolution of submission point 00223.134 in terms of the reasons for that submission. I see the need to improve recognition within APP3 of mānuka and kānuka as taoka species and reconcile APP3 with other pORPS provisions to improve consistency of implementation.

83. In terms of whether mānuka and kānuka should be deleted from availability for biodiversity offsetting, as requested in submission, I understand on the basis of the literature review in Appendix 2, and council evidence, that a case by case assessment is likely required. Biodiversity offsetting will not always be appropriate, depending on a range of factors, including the age of the affected trees. In some circumstances, such as clearance of young regenerating trees on disturbed land, it may well be a viable option. I have concluded that application of mātauraka Māori or incorporation of mātauraka Māori in decision-making, as recommended above, which will necessarily involve assessment by Kāi Tahu, is the best way to provide for these taoka species and Kāi Tahu relationship with them.

84. In addition to the above recommendation I believe it needs to be made clear that availability of biodiversity offsetting for these species does not equate to ability to employ biodiversity offsetting in every circumstance. APP3(2) has been amended to state that biodiversity offsetting *may* be available if specified criteria are met. I support this amendment as necessary and important to reflect the significance of these taoka species. I do not consider that it is enough to employ the criteria in APP3(2) and only then reference mātauraka Māori. It is appropriate to apply or incorporate mātauraka Māori into the proposal as part of application for resource consent, as I've recommended in relation to APP3(3), but prior to applying for resource consent I consider it is also appropriate that mātauraka Māori is part of the criteria for assessing whether biodiversity offsetting should be available in that particular circumstance. For that reason I also recommend including a further criterion (j) in APP3(2), as follows:

"…, and

(j) the offset accords with mātauraka Māori when taoka species are affected, and"

85. My opinion is that these two amendments will ensure that Kāi Tahu are consulted prior to development of an application for resource consent to assess whether offsetting accords with mātauraka Māori when taoka species are affected. A range of taoka species are already identified in Schedule 97 of the Ngāi Tahu Claims Settlement Act 1998, including mānuka and kānuka. If offsetting is considered appropriate, in accordance with mātauraka Māori, then Kāi Tahu will also be able to contribute to the proposal by applying mātauraka Māori to manage the offset and its intended outcomes. I consider these proposed amendments to be consistent with ECO-P1, CE-P13, IM-P3, IM-P6, MW-M1 and MW-M2.

SECTION 42A CHAPTER 12 AND SUPPLEMENTARY

Contaminated Land

86. I contributed to pre-hearing discussions regarding resolution of Ngāi Tahu ki Murihiku submission point 00223.119, which highlighted the importance of addressing closed landfills as part of climate change response due to increasing risks of flooding and erosion. I support the supplementary evidence of Mr McLennan to the Section 42A Report (Chapter 12 at paragraphs 30 to 35) where he addresses the results of pre-hearing discussions and provides recommended amendments. I note that Ms McIntyre has picked up a lack of prioritisation in the proposed amendments, which we had discussed with the council. Introducing prioritisation to the recommended amendments would satisfactorily addresses this issue of high importance to Ngāi Tahu ki Murihiku, as expressed in submission and highlighted in the evidence of Evelyn Cook at paragraph 13.

Conclusion

87. Many of the submission points of Ngāi Tahu ki Murihiku have been appropriately addressed in the Section 42A reports and supplementary evidence, resulting in recommended changes to the pORPS that settle those points. My evidence has outlined additional amendments that in my opinion are needed to address outstanding Ngāi Tahu ki Murihiku submission points and improve this regional policy statement.

Maria Bartlett
23 November 2022

APPENDIX 1: Overview of Provisions Addressing RMIA Issues of Significance

Issue of significance	Provisions	Issues not specifically addressed
Wai Māori		
Water management addressing Kāi Tahu cultural values and interests (RMIA-WAI-I2)	LF-WAI-P2(2) LF-WAI-P4 LF-WAI-M1	
Poor recognition of mātauraka (RMIA-WAI-I4)	LF-WAI-P2(4) LF-WAI-M1(6) LF-FW-M9	
Poor integration or management (RMIA-WAI-I5)	LF-WAI-P2(5) LF-WAI-P3	
Water quality concerns (RMIA-WAI-I5) - Poor land management - Discharges of contaminants - Discharges from mining	 LF-LS-O12 LF-FW-P14	 Discharges from mining
Water allocation concerns (RMIA-WAI-I5) - Over-allocation - Inefficiency - Increased domestic demand - Long duration consents - Cross-mixing of waters - Groundwater and surface water interaction	 LF-FW-P13 LF-LS-P20 UFD-P8 and LF-FW-M6 LF-FW-P14	 Consent durations (Cross-mixing of waters – a matter for the freshwater planning instrument)
Channel modification and river works (RMIA-WAI-I5) - Instream effect of dams - Diversions for mining - Channel maintenance - Channel modification - Bed disturbance, dredging and extraction - Willow removal - Exotic weed spread - Loss of indigenous vegetation	 ECO-M4 LF-FW-P13 LF-FW-P13 ECO-M5, M8 LF-LS-M13	 Instream dam effects Mining diversions Willow removal
Reduction of mahika kai and biodiversity (RMIA-MKB-I1)		

- Discharge of contaminants - Soil contamination - Urban spread - Genetic modification - Invasion of pests - Loss of freshwater species - Lack of habitat corridors - Lack of catchment wide riparian management - Stock grazing in remnant bush - Poor forestry development - Lack of recognition of mātauraka - Impact on cultural knowledge transfer	CE-M3 HAZ-CL-P14 UFD-O4 ECO-M4, M5 LF-FW-P13 LF-FW-P13 LF-FW-P13 LF-LS-M12 ECO-P1 ECO-O3	Genetic modification (note that genetic modification of species may occur through movement between catchments or ecological districts that affects localised populations, rather than referring to Genetically Modified Organisms covered by the Hazardous Substances and New Organisms Act 1996)
Barriers to customary harvest (RMIA-MKB-I2)	LF-LS-P22	(note that regulatory barriers to customary harvest include matters beyond the RMA)
Impacts of climate change (RMIA-MKB-I3)	ECO-P10	
Lack of secure or protected areas (RMIA-MKB-I4)	ECO-P3	
Inconsistent approaches (RMIA-MKB-I5)	LF-FW-P13A ECO-P6	
Lack of species specific information (RMIA-MKB-I6)	ECO-M7	
Wāhi tūpuna values poorly recognised (RMIA-WTU-I1) - Character change from land use - Infrastructure impacts - Earthworks modifying land forms - Earthworks affecting wāhi tapu - Sedimentation from earthworks - Degradation of whenua from land use - Failure to recognise Kāi Tahu names	 HVT-WT-P2 EIT-INF-P13 HCV-HH-M4 LF-LS-M13 HCV-WT-M2 HCV-WT-P1	
Degradation of wāhi tapu and wāhi taoka (RMIA-WTA-I1) - Earthworks impacts - Discharge of contaminants	 HCV-HH-M4 HCV-WT-P2	

- Disturbance of kōiwi takata - Poor records and identification	HCV-WT-P2 HCV-WT-M1	
Access to wāhi tapu and wāhi taoka (RMIA-WTA-I2)	HCV-WT-P2	
Cultural impacts of air discharges poorly recognised (RMIA-AA_I1) - Climate change impacts - Data deficiency - Effects on people and mahika kai - Discharges from crematoriums - Vegetation burning impacting tapu - Odour affecting significant sites - Reduced visibility of sky - Dust affecting rock art sites	 IM-P10 AIR-M4 AIR-O1 AIR-P6 AIR-P6 HCV-HH-M4 CE-P4 AIR-P6	
Lack of integrated management affecting coastal environment (RMIA-CE-I1) - Modifications affecting waterways - Reduced river flows - Barriers to species migration - Changes in sediment transport - Effects of land reclamation - Poor land use management - Climate change impacts	 CE-P1 LF-WAI-P3 CE-P5 CE-P4 CE-P12 CE-P9 CE-O1	
Discharges in to coastal water (RMIA-CE-I2) - Point source discharges - Contaminated land leachate - Discharge of sewerage - Stormwater discharge - Ship bilge discharge - Proliferation of rubbish - Fish processing waste - Oil and chemical spills - Discharge of human remains	 CE-M3 HAZ-CL-P14 CE-M3 CE-M3 CE-P3 CE-M3 CE-P13	Matters associated with generation of waste in the coastal environment
Reduced ability to harvest kaimoana (RMIA-CE-I3) - Modifications affecting waterways - Effects of reclamation - Vehicle access on beaches	 CE-P13 CE-M3 CE-P12 CE-M5	Invasive species in the coastal environment

- Aquaculture activities - Discharge effects on water quality - Invasive species - Loss of access to coastal land	CE-P11 CE-P3 CE-P5 CE-P8	
Habitat disturbance affecting marine species (RMIA-CE-I4)	CE-P5	
Poor recognition of wāhi tūpuna and wāhi tapu (RMIA-CE-I5) - Damage to wāhi tapu - Land fragmentation affecting access - Loss of integrity of cultural landscapes - Disturbing from mining activities - Restricted access to tauraka waka and trails - Cumulative effects - Climate change impacts	 CE-M3 CE-M4 HCV-WT-P2 CE-M4 CE-P9	 Mining activities disturbing wāhi tūpuna in the coastal environment. Cumulative effects
Protection of pounamu resources (RMIA-PO-I1)	HCV-WT-P2	Protection of pounamu.

Table 1: Overview of RMIA issues of significance and where they are addressed

Appendix 2: Mānuka and Kānuka Literature Review

The following is an abridged version of the literature review drafted by Rata Pryor Rodgers of Kitson Consulting Limited in July 2022 for Te Ao Mārama Incorporated, to support the proposed Otago Regional Policy Statement hearing process.

Mānuka and Kānuka Literature Review

Context

In the proposed Otago Regional Policy Statement ("pORPS") mānuka and kānuka are excluded from biodiversity offsetting requirements (APP3 - Criteria for biodiversity offsetting).

In the Te Ao Marama Inc. ("TAMI") submission they asked for the removal of the exception for mānuka and kānuka, as these two species are taonga species in the Ngāi Tahu Settlement Claims Act ("NTSCA"), and must be treated appropriately as taonga.

Forest and Bird have also requested mānuka be deleted as an exception and DOC have proposed amendments which did not exempt kānuka and mānuka.

The Otago Regional Councils rationale for rejecting the TAMI submission point is based on the ecological advice from Wildland Ecology and follows below:

> Ngāi Tahu ki Murihiku seeks the exception for mānuka and kānuka is removed from clause (1)(b). I presume the submitter is referring to clause 1(a) and clause 1(b) as clause (1)(b) only refers to mānuka. Ecological advice is that "*the threat classification for mānuka and species of kānuka were raised as a precautionary approach to the threat myrtle rust poses to the species. All species of kānuka are now classified as Threatened and mānuka is classified as At-Risk Declining. The two species of kānuka in Otago have unknown susceptibility to myrtle rust, while mānuka is known to be susceptible. Myrtle rust has been recorded as far south as Christchurch and Hokitika but to date has not been recorded in Otago. Therefore, the elevated threat status of mānuka and kānuka would trigger the bottom lines in APP3. However, the reason for the elevated threat status does not apply in Otago because of the absence of the threat of myrtle rust in Otago*"[492]. Furthermore, "*the loss of kānuka would not necessarily be significant and there would be practical options for offsetting such loss given the ability of this species to regenerate naturally in suitable environments and the ease of propagating and planting kānuka*"[493]. Therefore, I do not recommend the submission.

Taonga Species

Both mānuka/kahikātoa and kānuka are taonga species as listed (under Schedule 97) in the NTSCA, meaning the Crown has acknowledged the special association Ngāi Tahu has with these species "The Crown acknowledges the cultural, spiritual, historic, and traditional association of Ngāi Tahu with the taonga species."[24]

Cultural Significance

Mānuka and kānuka have an intrinsic value through the whakapapa connections shared between these species and tangata whenua. This whanaungatanga creates the basis for the kaitiaki obligations to the species. [25]

Mānuka

Every part of the mānuka plant was used by Māori. The red hardwood timber is strong, durable and often straight. The uses included: rongoā, as a food source, for fishing and weaponry and as a building material[26].

[24] Ngai Tahu Claims Settlement Act 1998. https://www.legislation.govt.nz/act/public/1998/0097/latest/DLM429090.html

[25] Te Runanga o Ngai Tahu (2018) Manuka to Ngai Tahu - briefing note appendix

[26] Tipa, R (2004, Makariri) Common shrub with a thousand uses. *Te Karaka* https://media.kareao.nz/images/Public/Text/2018-0539-NTCTK-024.pdf

To Ngāi Tahu it was a highly prized and extensively used resource. Its chemical and antibacterial properties were known and employed by Ngāi Tahu in various daily uses. [27] The use of this species required the observance of certain tikanga protocols. [28]

In a contemporary sense the importance of mānuka in bush regeneration is very important to Ngāi Tahu . The use of mānuka in providing the first cover for regeneration of the forests is considered a symbol of the iwi continuing to exercise kaitiakitanga to the whenua and species we are connected to. [29]

Weapons [30]

Mānuka was used for a variety of weapon types and styles.

- Taiaha
- Clubs
- Spears
- Paiaka (mainly made from mānuka in Te Ika a Maui)

Construction and Tools [31]

To Ngāi Tahu mānuka was a favoured construction material due to its versatility and availability, it could be processed to enhance its flexibility and hardened to increase its durability. It was used for maimai and temporary shelters, as well as for dams, weirs and earthworks. It was also used for large-scale defence systems, taramānuka involved strategic burning of mānuka. [32]

- Handles for garden tools, axes and adze
- Hoe (paddles)
- Bailers
- Stakes lashed into place as free draining floors on canoe decks

[27] Te Runanga o Ngai Tahu (2018) Manuka to Ngai Tahu - briefing note appendix

[28] Te Runanga o Ngai Tahu (2018) Manuka to Ngai Tahu - briefing note appendix

[29] Te Runanga o Ngai Tahu (2018) Manuka to Ngai Tahu - briefing note appendix

[30] Tipa, R (2004, Makariri) Common shrub with a thousand uses. *Te Karaka* https://media.kareao.nz/images/Public/Text/2018-0539-NTCTK-024.pdf

[31] Tipa, R (2004, Makariri) Common shrub with a thousand uses. *Te Karaka* https://media.kareao.nz/images/Public/Text/2018-0539-NTCTK-024.pdf

[32] Te Runanga o Ngai Tahu (2018) Manuka to Ngai Tahu - briefing note appendix

- Windbreaks to shelter gardens

Mahinga Kai [33] [34]

Mānuka was utilised in a range of hunting and fishing technologies. For Ngāi Tahu the specific hunting and fishing of certain species was dependent on the availability of mānuka.[35]

- Snares and traps
- Fish traps (stakes pushed into sand and mud of a river bank to catch tuna and kanakana)
- Drying racks for tuna
- Finer branches woven into tuna pots
- Long tapered lengths were used as fishing rods
- Fishing hooks made from roots - very strong used to catch sharks
- Poutini Māori used it as an improvised net to catch whitebait

Food

Mānuka was used by Ngāi Tahu in cooking and food preparation. It was used to store clean water, which was very important as the standard water storage of hue (gourds) could not be grown in the south[36]. Pia mānuka the sugary gum was given to babies and considered a delicacy. [37]

Other [38]

- Carving medium
- Used in sports and recreation

[33] Tipa, R (2004, Makariri) Common shrub with a thousand uses. *Te Karaka* https://media.kareao.nz/images/Public/Text/2018-0539-NTCTK-024.pdf

[34] Wai 262 (2011) Ko Aotearoa tenei. https://forms.justice.govt.nz/search/Documents/WT/wt_DOC_68356054/KoAotearoaTeneiTT1W.pdf

[35] Te Runanga o Ngai Tahu (2018) Manuka to Ngai Tahu - briefing note appendix

[36] Te Runanga o Ngai Tahu (2018) Manuka to Ngai Tahu - briefing note appendix

[37] Tipa, R (2004, Makariri) Common shrub with a thousand uses. *Te Karaka* https://media.kareao.nz/images/Public/Text/2018-0539-NTCTK-024.pdf

[38] Tipa, R (2004, Makariri) Common shrub with a thousand uses. *Te Karaka* https://media.kareao.nz/images/Public/Text/2018-0539-NTCTK-024.pdf

- Tokotoko (walking staff)
- Needles
- Hair combs
- Eating bowls
- Tukutuku panels [39]
- Hot clean burning wood

Rongoā

Mānuka is considered a "cure all of the Maori medicine cabinet", for its antihistamine, antibacterial and antifungal properties[40] [41]. Leaves, bark, gum, shoots, seeds smoke and honey were used to treat a variety of conditions.

Kānuka

Some uses include[42]:

- For weapons, clubs, mauls and spear shafts,
- Digging tools,
- Canoe paddles,
- Toys - spinning tops.
- Bark used as waterproof material for dwellings. [43]
- Durable dense harwood burns hot. [44]

[39] Wai 262 (2011) Ko Aotearoa tenei. https://forms.justice.govt.nz/search/Documents/WT/wt_DOC_68356054/KoAotearoaTeneiTT1W.pdf

[40] Tipa, R (2004, Makariri) Common shrub with a thousand uses. *Te Karaka* https://media.kareao.nz/images/Public/Text/2018-0539-NTCTK-024.pdf

[41] Wai 262 (2011) Ko Aotearoa tenei. https://forms.justice.govt.nz/search/Documents/WT/wt_DOC_68356054/KoAotearoaTeneiTT1W.pdf

[42] Tipa, R (2013) He Aitaka a Tane Kanuka, a victim of mistaken identity. *Te Karaka* https://ngaitahu.iwi.nz/our_stories/kānuka-a-victim-of-mistaken-identity/

[43] Tipa, R (2013) He Aitaka a Tane Kanuka, a victim of mistaken identity. *Te Karaka* https://ngaitahu.iwi.nz/our_stories/kānuka-a-victim-of-mistaken-identity/

[44] Tipa, R (2013) He Aitaka a Tane Kanuka, a victim of mistaken identity. *Te Karaka* https://ngaitahu.iwi.nz/our_stories/kānuka-a-victim-of-mistaken-identity/

- Used for tea and bush beer.[45]

Rongoā [4647]

Mature kānuka are preferred in rongoā due to the higher healing properties and to allow the young to grow. [48] Leaves, gum, bark, seeds and fruits were used to treat a variety of conditions.

WAI 262

The key points of concern raised by the Wai 262 claim have been summarised by Aroha Mead, who outlines the following[49]:

- That the Crown has failed to actively protect the ability of Māori to exercise tino rangatiratanga and kaitiakitanga in relation to indigenous flora and fauna, mātauranga Māori and other taonga;
- That the Crown has failed to protect taonga;
- That the Crown has usurped the tino rangatiratanga and kaitiakitanga of Māori in relation to taonga through the development of policy and the enactment of laws; and
- That the Crown has entered into international trade agreements and obligations which further impact on taonga.

In 2001 the Waitangi Tribunal released its report " Ko Aotearoa Tēnei" recommending wide-ranging reforms to laws and policies and calling for the Crown-Māori relationship to move into a new era of partnership. The Tribunal found that Māori knowledge of native species is a form of taonga over which Māori were guaranteed tino rangatiratanga, and that state law and government practice has

[45] Tipa, R (2013) He Aitaka a Tane Kanuka, a victim of mistaken identity. *Te Karaka* https://ngaitahu.iwi.nz/our_stories/kānuka-a-victim-of-mistaken-identity/

[46] Tipa, R (2013) He Aitaka a Tane Kanuka, a victim of mistaken identity. *Te Karaka* https://ngaitahu.iwi.nz/our_stories/kānuka-a-victim-of-mistaken-identity/

[47] Whare, T. (2020) Some thoughts about Kanuka and Intellectual Property. In *Kanuka Handbook.* (pp 20 - 23). https://hikurangi.enterprises/wp-content/uploads/2020/02/K%C4%81nuka-Handbook.pdf

[48] Ngata-Aerengamate, T. A. (2020) *Matauranga Maori and anti-microbials: searching for new tools to control the spread of Kauri Dieback*.(Master's thesis, Victoria Univeristy of Wellington. https://researcharchive.vuw.ac.nz/xmlui/bitstream/handle/10063/9458/thesis_access.pdf?sequence=1

[49] Pooter, H. & Mangai, R. (2022) A Wai 262 best practice guide for science partnerships with kaitiaki for research involving taonga. https://irp.cdn-website.com/855a29e4/files/uploaded/Wai262-Report-Rauika-Ma%CC%84ngai-1.pdf

not respected tino rangatiratanga over Māori knowledge. The Tribunal proposed that this breach be addressed by allowing Māori to exercise control over taonga in the form of kaitiakitanga. [50]

Threat Status

In the most recent evaluation of the conservation status all New Zealand Myrtaceae, including mānuka and kānuka, were treated with a precautionary approach by the evaluation panel due to the threat posed by Myrtle rust and had their threat status elevated. Those "previously considered to be Not Threatened as 'Threatened', and elevated the status of those previously assessed as At Risk to Threatened." [51]

Mānuka

Mānuka (*Leptospermum scoparium* J.R.Forst. & G.Forst. var. *scoparium*) were considered to be data poor and are classified as "At-Risk - declining", this threat status means it has a "very large populations and low to high ongoing predicted decline. Less than 100,000 mature individuals. Predicted decline 10-70%.". Other variants of mānuka were considered "Threatened - Nationally Vulnerable" and "Threatened - Nationally Critical". [52]

Kānuka

All species are considered data poor, and the two species (*K. robusta* and *K. serotina*) found in Otago are classified as "Threatened - Nationally Vulnerable". Other kānuka species are considered "Threatened - Nationally Endangered". [53]

Ecological Importance

Mānuka

Distribution

[50] Lopez-Ubiria, I. & Vidiella-Salaberry, A. (2020) The Bioactivity of Kanuka. In *Kanuka Handbook.* (pp 20 - 23). https://hikurangi.enterprises/wp-content/uploads/2020/02/K%C4%81nuka-Handbook.pdf

[51] De Lange, P et al (2017) Conservation status of New Zealand indigenous vascular plants, 2017. Publishing Team, Department of Conversation. https://www.doc.govt.nz/Documents/science-and-technical/nztcs22entire.pdf

[52] De Lange, P et al (2017) Conservation status of New Zealand indigenous vascular plants, 2017. Publishing Team, Department of Conversation. https://www.doc.govt.nz/Documents/science-and-technical/nztcs22entire.pdf

[53] De Lange, P et al (2017) Conservation status of New Zealand indigenous vascular plants, 2017. Publishing Team, Department of Conversation. https://www.doc.govt.nz/Documents/science-and-technical/nztcs22entire.pdf

Mānuka/kahikātoa is the most widespread indigenous shrub in New Zealand [54], and is common throughout Aotearoa from the North to Rakiura, ranging from lowland and coastal areas up to 1800 m above sea level. It is a highly adaptable plant[55] and inhabits many different areas including wetlands, river gravels and dry hillsides. Once mature, it is very tolerant of drought, waterlogging, strong winds and frost and it can grow in less fertile, colder, wetter and more acidic sites than kānuka.[56] It can grow as a scrub or tree up to eight metres tall[57].

Mānuka is probably the most widely distributed, abundant and environmentally tolerant member of New Zealand's indigenous woody flora. [58]The life-history of mānuka is adapted for dispersal, colonisation and rapid population growth. It has typical pioneer species characteristics which includes: short life cycle, rapid growth rates, relatively short stature, wide ecological amplitude, great seed production and high light demands. [59]

There are five geographically distinct mānuka gene pools within New Zealand, with evidence of gene flow between the pools. One of the clades is the 'South-West South Island', which has undergone an expansion event (362,230 generations ago) by ~458.03%. [60]

Prior to human arrival, mānuka had a more limited distribution but human clearance (fire and land clearance) has created suitable habitat for mānuka. [61] These ongoing disturbance processes such as nutrient leaching, repeated fires and soil erosion have helped maintain mānuka cover in many areas where the plant community would eventually return to forest. [62]

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[54] Stephens, J. M. C., Molan, P. C., & Clarkson, B. D. (2005). A review of Leptospermum scoparium (Myrtaceae) in New Zealand. *New Zealand Journal of Botany*, *43*(2), 431-449.

[55] Stephens, J. M. C., Molan, P. C., & Clarkson, B. D. (2005). A review of Leptospermum scoparium (Myrtaceae) in New Zealand. *New Zealand Journal of Botany*, *43*(2), 431-449.

[56] DOC (n.d.) Manuka/kahikatoa and kanuka. https://www.doc.govt.nz/nature/native-plants/manuka-kahikatoa-and-kanuka/

[57] Stephens, J. M. C., Molan, P. C., & Clarkson, B. D. (2005). A review of Leptospermum scoparium (Myrtaceae) in New Zealand. *New Zealand Journal of Botany*, *43*(2), 431-449.

[58] Ronghua, Y., Mark, A. F., & Wilson, J. B. (1984). Aspects of the ecology of the indigenous shrub Leptospermum scoparium (Myrtaceae) in New Zealand. *New Zealand journal of botany*, *22*(4), 483-507.

[59] Derraik, J. G. (2008). New Zealand mānuka (Leptospermum scoparium; Myrtaceae): a brief account of its natural history and human perceptions. *New Zealand Garden Journal*, *11*(2), 4-8.

[60] Koot, E., Arnst, E., Taane, M., Goldsmith, K., Thrimawithana, A., Reihana, K., ... & Chagné, D. (2022). Genome-wide patterns of genetic diversity, population structure and demographic history in mānuka (Leptospermum scoparium) growing on indigenous Māori land. *Horticulture research*, *9*.

[61] Derraik, J. G. (2008). New Zealand mānuka (Leptospermum scoparium; Myrtaceae): a brief account of its natural history and human perceptions. *New Zealand Garden Journal*, *11*(2), 4-8.

[62] Derraik, J. G. (2008). New Zealand mānuka (Leptospermum scoparium; Myrtaceae): a brief account of its natural history and human perceptions. *New Zealand Garden Journal*, *11*(2), 4-8.

Succession

Mānuka is a key species in the early stages of succession following large scale disturbances in many New Zealand forests, where it can act as a nurse crop. This role is played in kauri forests, podocarp forests, montane rainforests in Fiordland and in beech forests the ectomycorrhizas of mānuka seem to assist in the process of seedling establishment. [63] Seral communities of mānuka form a significant part of its current range. [64]

Permanent dominance

Permanent dominance occurs on sites that are unfavourable for the development of climax forest (these sites are common throughout New Zealand) as they are too wet, dry, cold, exposed etc. [65]

Erosion Control

Mānuka is valuable for erosion control, as the scrub can provide a rapidly growing protection from landslides and mature stands contribute to erosion control through interception of a large amount of rainfall and together with soil binding by its roots. [66]

Carbon Sequestration

Carbon accumulation by mānuka is rapid and considered similar to that of plantation forestry.[67]

Biodiversity

- The rare non-green orchid shares mycorrhizae with mānuka (along with other species). [68]

[63] Derraik, J. G. (2008). New Zealand mānuka (Leptospermum scoparium; Myrtaceae): a brief account of its natural history and human perceptions. *New Zealand Garden Journal*, *11*(2), 4-8.

[64] Stephens, J. M. C., Molan, P. C., & Clarkson, B. D. (2005). A review of Leptospermum scoparium (Myrtaceae) in New Zealand. *New Zealand Journal of Botany*, *43*(2), 431-449.

[65] Stephens, J. M. C., Molan, P. C., & Clarkson, B. D. (2005). A review of Leptospermum scoparium (Myrtaceae) in New Zealand. *New Zealand Journal of Botany*, *43*(2), 431-449.

[66] Stephens, J. M. C., Molan, P. C., & Clarkson, B. D. (2005). A review of Leptospermum scoparium (Myrtaceae) in New Zealand. *New Zealand Journal of Botany*, *43*(2), 431-449.

[67] Stephens, J. M. C., Molan, P. C., & Clarkson, B. D. (2005). A review of Leptospermum scoparium (Myrtaceae) in New Zealand. *New Zealand Journal of Botany*, *43*(2), 431-449.

[68] Stephens, J. M. C., Molan, P. C., & Clarkson, B. D. (2005). A review of Leptospermum scoparium (Myrtaceae) in New Zealand. *New Zealand Journal of Botany*, *43*(2), 431-449.

- Acts as a host for large leafed mistletoe, the parasitic dwarf leafless mistletoe attaches preferentially to Mānuka and Kunzea.[69]

- Insect associations are those involved in pollination. [70]

Pests

- Scale insects. [71]

- Mānuka blight is associated with infestation by the introduced scale insect species and development of a covering sooty mould. [72] In the first decade of spread it caused widespread mortality. It was then used as a biological control and celebrated as a solution for the mānuka problem. Nowadays it only affects mānuka to a moderate degree. [73]

Antimicrobial properties

Prosser et al (2014) found a potential use of mānuka in the rehabilitation of microbial contained sites, by reducing the microbial contaminants from land applied biosolids.[74] The antimicrobial agents of mānuka can end up in the solid via a number of pathways e.g. through rhizodeposition and degradation of plant material. [75] One option for rehabilitation of sites may be the planting of mānuka as a cover species on such sites with the aim of eventually regenerating native vegetation. [76]

Economic Importance

[69] Stephens, J. M. C., Molan, P. C., & Clarkson, B. D. (2005). A review of Leptospermum scoparium (Myrtaceae) in New Zealand. *New Zealand Journal of Botany*, *43*(2), 431-449.

[70] Stephens, J. M. C., Molan, P. C., & Clarkson, B. D. (2005). A review of Leptospermum scoparium (Myrtaceae) in New Zealand. *New Zealand Journal of Botany*, *43*(2), 431-449.

[71] Stephens, J. M. C., Molan, P. C., & Clarkson, B. D. (2005). A review of Leptospermum scoparium (Myrtaceae) in New Zealand. *New Zealand Journal of Botany*, *43*(2), 431-449.

[72] Stephens, J. M. C., Molan, P. C., & Clarkson, B. D. (2005). A review of Leptospermum scoparium (Myrtaceae) in New Zealand. *New Zealand Journal of Botany*, *43*(2), 431-449.

[73] Derraik, J. G. (2008). New Zealand mānuka (Leptospermum scoparium; Myrtaceae): a brief account of its natural history and human perceptions. *New Zealand Garden Journal*, *11*(2), 4-8.

[74] Prosser, J. A., Anderson, C. W. N., Horswell, J., & Speir, T. W. (2014). Can mānuka (Leptospermum scoparium) antimicrobial properties be utilised in the remediation of pathogen contaminated land?. *Soil Biology and Biochemistry*, *75*, 167-174.

[75] Prosser, J. A., Anderson, C. W. N., Horswell, J., & Speir, T. W. (2014). Can mānuka (Leptospermum scoparium) antimicrobial properties be utilised in the remediation of pathogen contaminated land?. *Soil Biology and Biochemistry*, *75*, 167-174.

[76] Prosser, J. A., Anderson, C. W. N., Horswell, J., & Speir, T. W. (2014). Can mānuka (Leptospermum scoparium) antimicrobial properties be utilised in the remediation of pathogen contaminated land?. *Soil Biology and Biochemistry*, *75*, 167-174.

Due to its antihistamine, antibacterial, and antifungal effects, mānuka is increasingly being exploited for commercial gain both in New Zealand and elsewhere, with uses including cosmetics, treatments for skin conditions, and post-surgical treatments, as well as sales of mānuka honey.[77]

Kānuka

Until the mid 1980's kānuka was classified as the same genus as mānuka before being reclassified as Kunzea[78]. It has recently been described as 10 species, two of which are found in the Otago region.

Kānuka is common throughout the lowland and mountain scrub and along forest margins throughout the North (with the exception of Taranaki) and South Islands south to the Otago region [79]. It is found from coastal areas to altitudes of 1800 metres. And inhabits a range of environments, except water-logged soils. It is very tolerant of wind, drought and frost.[80] [81]

Kānuka Forests

Kānuka can form a distinctive type of forest, although they are usually the first step towards mature native forest in the areas where they establish[82].

Kānuka grows to form dense scrub and then, as the dominant stems grow and the others are suppressed and die, it can form a kānuka forest. A kānuka forest will generally diversify and ultimately be replaced in a natural succession by a mixed forest. Kānuka forests can survive if the plants beneath the trees are heavily browsed by animals, but removing browsing animals from the understorey will allow a diverse forest to become established. [83]

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[77] Wai 262 (2011) Ko Aotearoa tenei. https://forms.justice.govt.nz/search/Documents/WT/wt_DOC_68356054/KoAotearoaTeneiTT1W.pdf

[78] Tipa, R (2013) He Aitaka a Tane Kanuka, a victim of mistaken identity. *Te Karaka* https://ngaitahu.iwi.nz/our_stories/kānuka-a-victim-of-mistaken-identity/

[79] DOC (n.d.) Manuka/kahikatoa and kanuka. https://www.doc.govt.nz/nature/native-plants/manuka-kahikatoa-and-kanuka/

[80] DOC (n.d.) Manuka/kahikatoa and kanuka. https://www.doc.govt.nz/nature/native-plants/manuka-kahikatoa-and-kanuka/

[81] Harcourt, N., & Awatere, S. (2022). Rapua ngā tohu (seeking the signs)—Indigenous knowledge-informed climate adaptation. In *Current Directions in Water Scarcity Research* (Vol. 4, pp. 267-297). Elsevier.

[82] Lopez-Ubiria, I. & Vidiella-Salaberry, A. (2020) The role of kānuka in the ecosystem. In *Kanuka Handbook.* (pp 20 - 23). https://hikurangi.enterprises/wp-content/uploads/2020/02/K%C4%81nuka-Handbook.pdf

[83] Lopez-Ubiria, I. & Vidiella-Salaberry, A. (2020) The role of kānuka in the ecosystem. In *Kanuka Handbook.* (pp 20 - 23). https://hikurangi.enterprises/wp-content/uploads/2020/02/K%C4%81nuka-Handbook.pdf

Kanuka has a relatively long lifespan, reportedly 80–150 years in the East Coast region (Burrows, 1973).[84]

Succession/ Regeneration

Kānuka has proven to be an important tool for revegetating bare or eroded slopes where other species cannot be established. Once it grows and creates shade and shelter from the wind, kānuka provides an excellent nursery for other slower growing native plants, and for lots of other species, therefore increasing biodiversity.[85]

The succession can take a very long time. One study in Otago found even after 70 years kānuka was still the dominant vegetation[86]. It notes that other studies have found succession through kanuka can take up to 200 years [87], and suggests that the process of replacement of kānuka to a podocarp-broadleaf forest will take several centuries[88].

Biodiversity

One study found that the diversity of the invertebrates in non-grazed 60-year-old kānuka forest can be as great as that found in primary forests. Extensive areas of kānuka support large numbers of forest birds, including threatened species such as whitehead/popokatea and fernbird.[89]

Forest growing through mānuka or kānuka shrubland has been found to be richer than gorse-dominated shrubland, and the pathway towards native forest regeneration is different as a result.[90]

Erosion Control

[84] Harcourt, N., & Awatere, S. (2022). Rapua ngā tohu (seeking the signs)—Indigenous knowledge-informed climate adaptation. In *Current Directions in Water Scarcity Research* (Vol. 4, pp. 267-297). Elsevier.

[85] Lopez-Ubiria, I. & Vidiella-Salaberry, A. (2020) The role of kānuka in the ecosystem. In *Kanuka Handbook.* (pp 20 - 23). https://hikurangi.enterprises/wp-content/uploads/2020/02/K%C4%81nuka-Handbook.pdf

[86] Allen, R. B., Partridge, T. R., Lee, W. G., & Efford, M. (1992). Ecology of Kunzea ericoides (A. Rich.) J. Thompson (kānuka) in east Otago, New Zealand. *New Zealand journal of botany*, *30*(2), 135-149.

[87] Allen, R. B., Partridge, T. R., Lee, W. G., & Efford, M. (1992). Ecology of Kunzea ericoides (A. Rich.) J. Thompson (kānuka) in east Otago, New Zealand. *New Zealand journal of botany*, *30*(2), 135-149.

[88] Allen, R. B., Partridge, T. R., Lee, W. G., & Efford, M. (1992). Ecology of Kunzea ericoides (A. Rich.) J. Thompson (kānuka) in east Otago, New Zealand. *New Zealand journal of botany*, *30*(2), 135-149.

[89] Lopez-Ubiria, I. & Vidiella-Salaberry, A. (2020) The role of kānuka in the ecosystem. In *Kanuka Handbook.* (pp 20 - 23). https://hikurangi.enterprises/wp-content/uploads/2020/02/K%C4%81nuka-Handbook.pdf

[90] Lopez-Ubiria, I. & Vidiella-Salaberry, A. (2020) The role of kānuka in the ecosystem. In *Kanuka Handbook.* (pp 20 - 23). https://hikurangi.enterprises/wp-content/uploads/2020/02/K%C4%81nuka-Handbook.pdf

The research carried out in the East Coast has shown that high-density kānuka scrub/forest is very effective at holding the land in severe rainstorms, and at maintaining slope stability on steep hill slopes which tend to be prone to soil-slips when in pasture. The level of protection against erosion provided by semi-mature or mature kānuka stands has been found to be due to the density of the trees' root mass, and their structure and strength.[91]

Bioactivity of Kānuka

Since 2000 there has been growing interest in the therapeutic potential of kānuka essential oil. Kānuka oil is increasingly used in aromatherapy. More scientific research and evidence is needed about its medical applications.[92]

Otago Region

The Otago region has a diverse range of forest, scrub, and shrubland types, spanning climatic and soil gradients [93], including two kānuka species and mānuka.[94] Kanuka dominated forests often form a significant habitat in the eastern and central Otago. [95]

Kunzea serotina [96]

In the South Island makahikatoa/*K. serotina* is found in the dry intermontane basins of north Canterbury and eastern Central Otago, amongst a range of other places further north and in the North Island.[97]

[91] Lopez-Ubiria, I. & Vidiella-Salaberry, A. (2020) The role of kānuka in the ecosystem. In *Kanuka Handbook.* (pp 20 - 23). https://hikurangi.enterprises/wp-content/uploads/2020/02/K%C4%81nuka-Handbook.pdf

[92] Lopez-Ubiria, I. & Vidiella-Salaberry, A. (2020) The Bioactivity of Kanuka. In *Kanuka Handbook.* (pp 20 - 23). https://hikurangi.enterprises/wp-content/uploads/2020/02/K%C4%81nuka-Handbook.pdf

[93] Wildland Consultants (2020) Mapping of significant habitats for indiginous fauna in terrestrial, freshwater and marine ecosystems in Otago Region. https://www.orc.govt.nz/media/10012/section-32-report-v61-appendices.pdf

[94] Wildland Consultants (2021) An overview of the state of indiginous biodiversity in the Otago Region. https://www.orc.govt.nz/media/10012/section-32-report-v61-appendices.pdf

[95] Wildland Consultants (2021) An overview of the state of indiginous biodiversity in the Otago Region. https://www.orc.govt.nz/media/10012/section-32-report-v61-appendices.pdf

[96] de Lange, P. J. (2014). A revision of the New Zealand Kunzea ericoides (Myrtaceae) complex. *PhytoKeys*, (40), 1.

[97] de Lange, P. J. (2014). A revision of the New Zealand Kunzea ericoides (Myrtaceae) complex. *PhytoKeys*, (40), 1.

K. serotina has the highest altitudinal limit of all the New Zealand Kunzea, growing above 1000 m above sea level, and reaching its maximum recorded elevation as stunted shrubs at 2000 m above sea level; however this altitude is quite unusual. [98]

In the montane and inland basin habitats, *K. serotina* appears to have a long-term presence, and, if left undisturbed by fire, it probably would form the natural climax woody vegetation, particularly in areas prone to summer drought and extreme frosts and snow falls during winter.[99]

In Central Otago *K. serotina* scrub has increased in density in recent decades, and is providing more habitat for indigenous forest birds and invertebrates. The traits that have allowed makahikatoa to increase are its relative unpalatability to mammalian browsing animals, and its resilience to fire.[100]

Kunzea robusta[101]

In north-eastern Otago, *K. robusta* is common around Trotters Gorge and the Horse Range but south of here it has an otherwise mainly coastal distribution, reaching its greatest abundance around Dunedin and on the adjacent Otago Peninsula. A few inland locations are known, especially around Lakes Hāwea and Wānaka, where the species is sympatric with *K. serotina*.

Kunzea robusta is also common along the northern and eastern foothills of the Dunstan Range south of which it occurs only very locally, in isolated patches along the Clutha River as far south as Kaitangata and Balclutha. These southerly outliers are not only the southern limit for the species but also for the genus worldwide.[102]

In the Silver Peaks and Silver Stream catchment north-west of Dunedin, extensive areas of former tussock grassland and mānuka (*Leptospermum scoparium*) shrubland have undergone transitions into more complex kānuka (*K. robusta*) forest and kānuka-broadleaved forest, and these transitions are ongoing. [103]

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[98] de Lange, P. J. (2014). A revision of the New Zealand Kunzea ericoides (Myrtaceae) complex. *PhytoKeys*, (40), 1.

[99] de Lange, P. J. (2014). A revision of the New Zealand Kunzea ericoides (Myrtaceae) complex. *PhytoKeys*, (40), 1.

[100] Wildland Consultants (2021) An overview of the state of indiginous biodiversity in the Otago Region. https://www.orc.govt.nz/media/10012/section-32-report-v61-appendices.pdf

[101] de Lange, P. J. (2014). A revision of the New Zealand Kunzea ericoides (Myrtaceae) complex. *PhytoKeys*, (40), 1.

[102] de Lange, P. J. (2014). A revision of the New Zealand Kunzea ericoides (Myrtaceae) complex. *PhytoKeys*, (40), 1.

[103] Wildland Consultants (2021) An overview of the state of indiginous biodiversity in the Otago Region. https://www.orc.govt.nz/media/10012/section-32-report-v61-appendices.pdf

Kunzea robusta is the most widespread member of the genus in New Zealand. It is mostly found in coastal and low lying areas and adjacent hill country. It does not usually grow in upper montane situations though it has occasionally been collected in places up to 1000 m above sea level.

Favouring disturbance, this is the species that is most frequently seen colonising marginal hill country, particularly in areas with slip-prone, poorly draining clay soils, or in the clay soils of the drier, drought-prone eastern parts of both islands.

It is sometimes regarded as a serious weed in these habitats because of its ability to rapidly reclaim rough pasture land.[104]

Kunzea robusta is, as a rule, not common within relatively intact indigenous forest systems, being mostly seen colonising slip scars, and other areas of damage resulting from flooding and/or storm damage. Nevertheless, in some forest types such as that dominated by kauri, occasional stands or scattered mature canopy trees can be found with ages of between 200 and 280 years.[105]

As a species, K. robusta provides a key habitat for a host of fungi, and the deep leaf litter it produces is also favoured by terrestrial orchids. Its branchlets are often heavily parasitised by the dwarf mistletoe and in some locations by the green mistletoe. And in many areas, K. robusta is the favoured habitat of geckos.[106]

The bark can provide a habitat for different lichens. And it is a host to a range of hornworts, liverworts and mosses. [107] It is also an important habitat for indigenous forest birds such as tītitipounamu (rifleman; *Acanthissita chloris*)[108]

[104] de Lange, P. J. (2014). A revision of the New Zealand Kunzea ericoides (Myrtaceae) complex. *PhytoKeys*, (40), 1.

[105] de Lange, P. J. (2014). A revision of the New Zealand Kunzea ericoides (Myrtaceae) complex. *PhytoKeys*, (40), 1.

[106] de Lange, P. J. (2014). A revision of the New Zealand Kunzea ericoides (Myrtaceae) complex. *PhytoKeys*, (40), 1.

[107] de Lange, P. J. (2014). A revision of the New Zealand Kunzea ericoides (Myrtaceae) complex. *PhytoKeys*, (40), 1.

[108] Wildland Consultants (2021) An overview of the state of indiginous biodiversity in the Otago Region. https://www.orc.govt.nz/media/10012/section-32-report-v61-appendices.pdf

Llyod et al (2020) suggest undertaking further bat surveys in the Otago regions in a range of different cover types including mānuka and/or kānuka. [109]

Myrtle Rust Impacts

Myrtle rust (*Austropuccinia psidii)*, a highly invasive airborne fungal pathogen, was first detected in the Far North in 2017 and has now spread to various parts of Aotearoa (including both urban areas and native forests) [110], and beyond its predicted climatic range[111].

There are significant concerns about the long-term impact of myrtle rust in Aotearoa to both native and introduced species [112], with Myrtaceae making up the second most ecologically important woody family in the New Zealand woody ecosystem[113]. The impacts include ecological, economic and cultural. Some impacts include:

- Multi-trophic risks - Sutherland et al (2020) found that highly infected plants had decreased insect activity and diversity[114].
- The impact on forest regeneration, given that Leptospermeae species are often succession species [115].
- Some suggest local extinctions are possible[116] [117].

[109] Wildland Consultants (2020) Mapping of significant habitats for indiginous fauna in terrestrial, freshwater and marine ecosystems in Otago Region. https://www.orc.govt.nz/media/10012/section-32-report-v61-appendices.pdf

[110] Sutherland, R., Soewarto, J., Beresford, R., & Ganley, B. (2020). Monitoring Austropuccinia psidii (myrtle rust) on New Zealand Myrtaceae in native forest. *New Zealand Journal of Ecology*, *44*(2), 1-5.

[111] Jo, I., Bellingham, P. J., McCarthy, J. K., Easdale, T. A., Padamsee, M., Wiser, S. K., & Richardson, S. J. (2022). Ecological importance of the Myrtaceae in New Zealand's natural forests. *Journal of Vegetation Science*, *33*(1), e13106.

[112] Sutherland, R., Soewarto, J., Beresford, R., & Ganley, B. (2020). Monitoring Austropuccinia psidii (myrtle rust) on New Zealand Myrtaceae in native forest. *New Zealand Journal of Ecology*, *44*(2), 1-5.

[113] Jo, I., Bellingham, P. J., McCarthy, J. K., Easdale, T. A., Padamsee, M., Wiser, S. K., & Richardson, S. J. (2022). Ecological importance of the Myrtaceae in New Zealand's natural forests. *Journal of Vegetation Science*, *33*(1), e13106.

[114] Sutherland, R., Soewarto, J., Beresford, R., & Ganley, B. (2020). Monitoring Austropuccinia psidii (myrtle rust) on New Zealand Myrtaceae in native forest. *New Zealand Journal of Ecology*, *44*(2), 1-5.

[115] Jo, I., Bellingham, P. J., McCarthy, J. K., Easdale, T. A., Padamsee, M., Wiser, S. K., & Richardson, S. J. (2022). Ecological importance of the Myrtaceae in New Zealand's natural forests. *Journal of Vegetation Science*, *33*(1), e13106.

[116] Harcourt, N., & Awatere, S. (2022). Rapua ngā tohu (seeking the signs)—Indigenous knowledge-informed climate adaptation. In *Current Directions in Water Scarcity Research* (Vol. 4, pp. 267-297). Elsevier.

[117] Sutherland, R., Soewarto, J., Beresford, R., & Ganley, B. (2020). Monitoring Austropuccinia psidii (myrtle rust) on New Zealand Myrtaceae in native forest. *New Zealand Journal of Ecology*, *44*(2), 1-5.

Mānuka is known to be susceptible to myrtle rust while the threat to the species of kānuka found in Otago are unknown, although one species of kānuka (*Kunzea aff. ericoides*) has been found to be susceptible. [118]

The Myrtle Rust Process Model has been implemented by NIWA to produce weekly maps of risk. They have found that the greatest predicted risk, which aligned with retrospective surveillance data, showed the greatest predicted risk was in the northern North Island and decreased further south, with substantial risk in the coastal areas of the north-western South Island during summer and autumn. Risk was low in southern coastal areas of the South Island and the lowest risk occurred in mountainous areas, particularly in the South Island. [119]

Myrtle rust has been found as far south as Hokitika and Christchurch as of 2021.[120] With expert Robert Beresford noting that "rust is likely to be establishing in Christchurch and can be expected to be seen more often from now on"[121]. With much more being known about the impact in Christchurch over the summer of 2022.[122]

As myrtle rust is of tropical origin and is well adapted to climates that are warmer than Aotearoa's current temperate conditions, it is expected that future warming will favour increased activity of the pathogen resulting in more moe damaging effects from this disease[123]. Campbell et al (2020) found that with different increasing temperature scenarios (1- 5 ℃) the risk of infection increased, with the largest increases in areas that are currently only marginally suitable (with respect to temperature) and that the latent periods decreased, particularly in places where winter

[118] MPI (u.n.) Ministry for Primary Industries Myrtle Rust susceptible host species. https://www.myrtlerust.org.nz/assets/Uploads/Suseptible-MR-Species.pdf

[119] Beresford, R. M., Turner, R., Tait, A., Paul, V., Macara, G., Zhidong, D. Y., ... & Martin, R. (2018). Predicting the climatic risk of myrtle rust during its first year in New Zealand. *New Zealand Plant Protection*, *71*, 332-347.

[120] Plant and Food (2022) Myrtle Rust surveillance. https://plantandfood.maps.arcgis.com/apps/webappviewer/index.html?id=db12ae762a0a4e3eb8c61b1f67120c3b

[121] Manaaki Whenua (2021) Myrtle rust find reported in Christchurch. https://www.landcareresearch.co.nz/discover-our-research/biosecurity/ecosystem-resilience/beyond-myrtle-rust/news/myrtle-rust-find-reported-in-christchurch/

[122] Manaaki Whenua (2021) Myrtle rust: iNaturalist reports from last season. https://www.landcareresearch.co.nz/discover-our-research/biosecurity/ecosystem-resilience/beyond-myrtle-rust/news/myrtle-rust-inaturalist-reports-from-last-season/

[123] Campbell R, Beresford R, Fitzherbert S, Carey-Smith T, Turner R. November 2020. Potential climate change impacts on myrtle rust risk in Aotearoa New Zealand. A Plant & Food Research report prepared for: Ministry for the Environment. Milestone No. 88789. Contract No. 38828. Job code: P/341114/01. PFR SPTS No. 20255.

temperatures slow or halt development [124]. Likely resulting in a spread of myrtle rust to higher altitudes and further south.

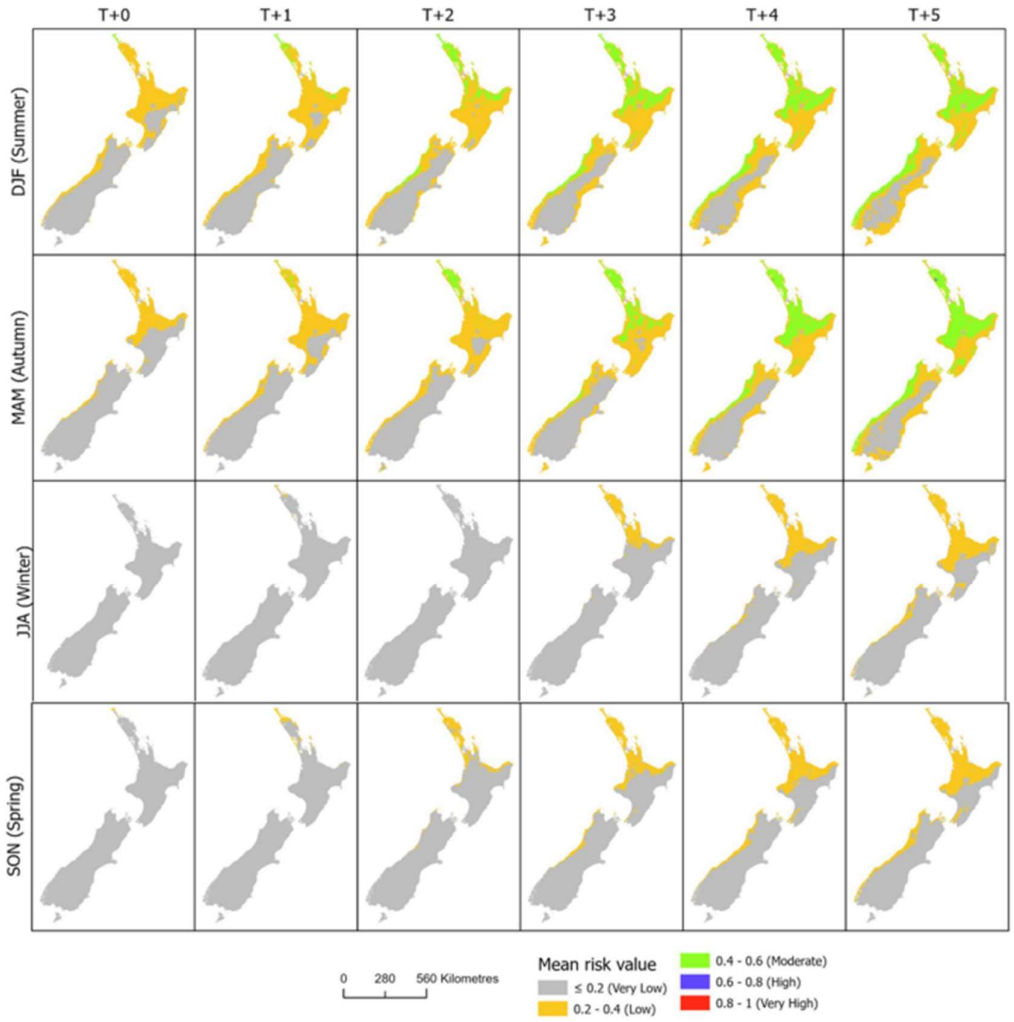

Figure 5. Predicted seasonal mean infection risk for current climate (T+0) and five climate change scenarios (T+1, T+2, T+3, T+4, T+5 °C). Infection risk derived from the myrtle rust process model with adjusted temperature and RH assumptions. Seasons are DJF = December, January, February (summer); MAM = March, April, May (autumn); JJA = June, July, August (winter) and SON = September, October, November (spring).

[124] Campbell R, Beresford R, Fitzherbert S, Carey-Smith T, Turner R. November 2020. Potential climate change impacts on myrtle rust risk in Aotearoa New Zealand. A Plant & Food Research report prepared for: Ministry for the Environment. Milestone No. 88789. Contract No. 38828. Job code: P/341114/01. PFR SPTS No. 20255.