ECOLOGICAL ADVICE ON INDIGENOUS BIODIVERSITY PROVISIONS IN THE PROPOSED OTAGO REGIONAL POLICY STATEMENT

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1. INTRODUCTION

Otago Regional Council are currently undertaking a legal review of the draft Otago Regional Policy Statement (RPS), and are working to finalise the indigenous biodiversity chapter. A particular concern is whether proposed bottom lines for Otago Region have been set at too high a bar, or will pose challenges for assessment. Otago Regional Council therefore requires an expert review of the indigenous biodiversity chapter, with particular regard to the policies containing bottom lines. Wildland Consultants were commissioned to provide this expert review, as set out in this report.

Headings in this report relate to the specific RPS objectives and policies that have been commented on, in a legal review. Less attention has been paid to methods, except where specific ecological matters require attention. In compiling this review particular attention has been given to comments in the legal review that relate to ecological issues.

2. OBJECTIVES

2.1 ECO-01 Ecosystems and indigenous biodiversity

Otago's ecosystems and indigenous biodiversity are healthy, abundant and thriving, previous decline in their quality, quantity and diversity has halted, and restoration is resulting in a net increase in the extent of Otago's indigenous biodiversity, the range of species present and the improved condition of areas that were previously degraded.

The legal review has raised concerns about the length of this objective, tautology within it, and ambiguity.

2.2 Comments

The terms 'ecosystems' and 'indigenous biodiversity' are both used in the objective, possibly to emphasise that both ecosystems and individual species and their assemblages are important. If this is the case, it would be better to refer to 'indigenous species' in addition to 'ecosystems'. It would, however, be more concise to refer to 'indigenous biodiversity' alone, as that term encompassess both ecosystems and species.

Use of the term 'range of species' is somewhat vague and potentially ambiguous because it could refer to the extent or the number of species. What it is probably intended to mean is the occupancy of species, i.e., that the species that are naturally present in Otago occupy a greater number of sites and/or larger population numbers are present. This is different from the extent of species, which only assesses their outer geographic extent. Occupancy accounts for both increases in extent, and 'filling in' of existing extent, i.e. increased numbers and densities.

The final part of the objective relates to ecological restoration resulting in "the improved condition of areas that were previously degraded". The legal review has identified that

this cannot be taken literally as many degraded areas (e.g. farmland, housing, and infrastructure) are not likely to have their indigenous biodiversity condition improved. This text is therefore probably not necessary. If Otago's indigenous biodiversity is healthy, abundant, and thriving, and the previous declines in its quality, quantity, and diversity have been halted, and restoration is leading to net increase in species occupancy, then this implies that the condition of degraded areas has been subject to meaningful improvement.

2.3 Suggested text for ECO-01

Option 1

ECO-01 Indigenous biodiversity

Otago's indigenous biodiversity is healthy, abundant and thriving, previous decline in its quality, quantity, and diversity has halted, and restoration is resulting in a net increase in its extent and occupancy.

Option 2

ECO-01 Indigenous biodiversity

Otago's indigenous ecosystems and populations of indigenous species are healthy and thriving, previous declines in quality, quantity, and diversity have been halted, and restoration is resulting in net increases in extent and occupancy.

3. POLICIES

3.1 ECO-P1 Significant indigenous vegetation and significant habitats of indigenous fauna

3.1.1 Current Policy

Protect areas of significant indigenous vegetation and significant habitats of indigenous fauna by:

(1) identifying them in accordance with BIO-SCHED1, and
(2) avoiding the adverse effects of activities that result in:
(a) loss of ecosystem representation or extent,
(b) disruption to sequences, mosaics or ecosystem function,
(c) fragmentation or loss of buffering or connectivity within the identified area and between other indigenous habitats and ecosystems, or
(d) loss of Kāi Tahu values.

The legal review suggested minor wording changes, but more significantly also noted that the policy appears to set bottom lines that should not be breached, with very broad coverage. The policy would therefore preclude most activities in significant indigenous

vegetation and habitats, which could be contentious (and potentially also not warranted or necessary).

3.1.2 Comments

The legal review suggested that enhancement should be included along with protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna, however the sub-paragraphs focus on prevention of adverse effects rather than enhancement of these areas. It is appropriate that more specificity is provided in sub-paragraph (1).

Policy ECO-P1 relates to Policy 3.9(a) of the draft National Policy Statement for Indigenous Biodiversity (draft NPSIB), which requires that adverse effects on the values of High ranked significant natural areas (SNAs) are avoided. Draft NPSIB Policy 3.9(a) provides exceptions relating to specified activities for SNAs classified as Medium, for adverse effects generated by protection, restoration, and enhancement activities, for adverse effects relating to the addressing of severe and immediate risks to public safety, and for SNAs based solely on the threats posed by myrtle rust (*Austropuccinia psidii*) to mānuka (*Leptospermum scoparium*), or kānuka (*Kunzea* spp.). ECO-P1, however, provides no such exemptions, and creates bottom lines preventing adverse effects on the specified attributes of SNAs.

The key requirement for SNAs is maintenance of the significant values which resulted in them being defined as significant. SNAs can have a variable cover of significant areas and often include areas that have been included in SNAs but are important only for buffering, and may include areas of low value early successional indigenous regeneration and/or exotic vegetation. In these cases, effects generated within the SNA but on the lower value indigenous regeneration or exotic habitats or within buffer areas may not result in any reduction of the significant values. Use of the term 'reduction' is preferred to 'loss', as the latter may imply complete loss as being what needs to be avoided, whereas the former requires that any reduction is avoided.

It is suggested that if the policy requires no reduction in the significant values for which the area was defined, then the sub-paragraphs relating to loss of ecosystem representation or extent, and disruption to sequences or mosaics, may not be required, as any such losses could only be of non-significant values.

The legal review raises a good point about bottom lines for areas outside of SNAs because, currently, avoiding adverse effects on SNAs would not be sufficient to avoid loss of ecosystem representation and extent, disruption to sequences, mosaics, and ecosystem function, fragmentation and loss of buffering, and reduction in population sizes and occupancy of threatened species.

Bottom lines for areas outside SNAs could be created around the extent and occupancy of more reduced ecosystem types and around significant habitats of indigenous fauna. For example, Wildland Consultants (2020a) mapped Otago's potential natural ecosystems and current natural ecosystems, and that mapping could be used to help identify significantly reduced (e.g. <20% remaining) ecosystems. Similarly, Wildland Consultants (2020b) mapped significant habitats of indigenous fauna across terrestrial,

freshwater, and marine ecosystems in Otago, although these areas have yet to be adopted in district or regional plans.

Maintenance of ecosystem function, and avoiding fragmentation or loss of buffering or connectivity outside an identified SNA, may be problematic as bottom lines, as there may not be reliable baselines for these values, or there may be insufficient information to determine appropriate bottom line thresholds.

A new policy would be needed to specify bottom lines for areas outside of SNAs. Such a policy could also address disruption of ecosystem functions and adverse effects caused by fragmentation and loss of buffering or connectivity, but probably should only capture significant examples of these, given the uncertainty about appropriate thresholds. A new policy should also address important fauna habitats since these are currently not well captured in statutory plans.

3.1.3 Possible text for a modified policy

Protect areas of significant indigenous vegetation and significant habitats of indigenous fauna by:

(1) identifying these areas in accordance with BIO-SCHED1, and

(2) avoiding the adverse effects of activities that result in:

(a) reduction of the significant values for which the area was defined, or

(b) loss of Kāi Tahu values.

3.1.4 Possible text for a new policy

Protect areas of indigenous vegetation and habitats of indigenous fauna throughout Otago by:

(1) avoiding the adverse effects of activities that result in:

(a) significant disruption to sequences, mosaics, and ecosystem functions, including disruption caused by the effects of fragmentation and loss of connectivity,

(b) significant adverse effects on important indigenous fauna habitats, or

(c) further loss of ecosystem extent for indigenous ecosystems that have been reduced to less than 20% of their original extent.

Note that only (c) provides an objectively-determined bottom line.

3.2 ECO-P2 Coastal indigenous biodiversity

3.2.1 Current Policy

Protect indigenous biodiversity in the coastal environment by:

(1) avoiding the adverse effects of activities on species and areas listed in Policy 11(a) of the New Zealand Coastal Policy Statement, and

(2) in areas of indigenous biodiversity in the coastal environment that are not identified under ECO-P1(1) or listed in Policy 11(a) of the New Zealand Coastal Policy Statement:

(a) identify these areas in accordance with Policy 11(b) of the New Zealand Coastal Policy Statement, and

(b) protect those areas by avoiding significant adverse effects in those areas.

The legal review also queried whether enhancement should be referred to in this policy, suggested other minor wording changes, and notes that the policy appears to simplify the requirements of Policy 11 of the New Zealand Coastal Policy Statement (NZCPS).

3.2.2 Comments

Not all of the values specified in NZCPS Policy 11(a) relate to species or areas; for example, NZCPS Policy 11(a) (iii) refers to indigenous ecosystems and vegetation types, which also need to be captured in ECO-P2.

ECO-P2 is silent about effects that don't have significant adverse effects on matters addressed in NZCPS Policy 11(b).

Furthermore, ECO-P2(2)(b) refers to the protection of areas, but may be better to refer to the protection of the indigenous biodiversity values within those areas.

3.2.3 Suggested text for ECO-P2

Protect indigenous biodiversity in the coastal environment by:

(1) avoiding the adverse effects of activities on species, ecosystems, vegetation types, and areas listed in Policy 11(a) of the New Zealand Coastal Policy Statement, and

(2) in areas of indigenous biodiversity in the coastal environment that are not identified under ECO-P1(1) or described in Policy 11(a) of the New Zealand Coastal Policy Statement:

(a) identify these areas in accordance with Policy 11(b) of the New Zealand Coastal Policy Statement, and

(b) protect the indigenous biodiversity values within those areas by avoiding significant adverse effects on those values and avoiding, remedying, or mitigating other adverse effects on those values.

3.3 ECO-P3 Maintaining ecosystems and indigenous biodiversity

3.3.1 Current Policy

Achieve a healthy functioning state and maintain the full range of Otago's indigenous habitats and ecosystems by applying the following prioritisation in decision-making on plans and resource consent applications:

(1) comply with ECO-P1 and ECO-P2 if relevant, then

(2) avoid adverse effects as a first priority,

(3) where adverse effects cannot be avoided, they are mitigated,

(4) where adverse effects cannot be avoided or mitigated, they are remedied,

(5) where more than minor residual adverse effects cannot be avoided, mitigated, or remedied, biodiversity offsetting is provided in accordance with ECO-SCHED2,

(6) if biodiversity offsetting of more than minor residual adverse effects is not possible, biodiversity compensation is provided in accordance with ECO-SCHED3, and
(7) if biodiversity compensation is not demonstrably achievable, the activity itself is avoided.

The legal review raised a range of concerns about the drafting of this policy, and whether the sub-paragraphs were consistent with the maintenance of Otago's biodiversity.

3.3.2 Comments

The legal review suggestion is appropriate, suggesting that simplification of the initial text is required as the current text, while wordy, is limiting in that it does not address species. It is also appropraite that remediation comes before mitigation in the mitigation hierarchy.

3.3.3 Suggested text for ECO-P3

Maintain the full range of Otago's indigenous biodiversity by applying the following prioritisation in decision-making:

(1) comply with ECO-P1 and ECO-P2, then
(2) avoid adverse effects as a first priority,
(3) where adverse effects cannot be avoided, they are remedied,
(4) where adverse effects cannot be avoided or remedied, they are mitigated,
(5) where more than minor residual adverse effects cannot be avoided, remedied, or mitigated, biodiversity offsetting is provided in accordance with ECO-SCHED2,
(6) if biodiversity offsetting of more than minor residual adverse effects is not possible, biodiversity compensation is provided in accordance with ECO-SCHED3, and
(7) if biodiversity compensation is not demonstrably achievable, avoid the activity.

3.4 ECO-P4 Enhancement

3.4.1 Current policy

Through decision-making on plans and resource consent applications, and non-regulatory actions, the spatial extent of Otago's indigenous biodiversity and range of species is increased by:

(1) restoring habitat for indigenous species,

(2) improving the health and resilience of ecosystems supporting indigenous biodiversity and important ecosystem services, including pollination, and

(3) buffering or linking ecosystems, habitats and areas that contribute to ecological corridors.

The legal review raised issues about redundant wording, the need to refer to intrinsic values, and the relationship between ecosystems and indigenous biodiversity.

3.4.2 Comments

As described above, it is suggested that the occupancy of Otago's indigenous biodiversity is referred to, as well as its extent. The reference to 'range of species' is not required, as species are a component of indigenous biodiversity. In addition to increasing the spatial extent and occupancy, the policy should also promote enhancement of the condition of existing indigenous biodiversity, for example through the control of pest plants and pest animals in an indigenous forest remnant. If condition is included, the word 'spatial' can be omitted. It is generally clear that extent and occupancy are spatial concepts.

The legal review also identified that 'enhancing' should be specifically referred to in sub-paragraph (1). Ecosystem services are referred to but generally relate only to the regulating functions of ecosystems. Referring to 'ecosystem functions' would provide wider coverage. It is not clear why pollination is singled out in subparagraph (2).

Ecosystems are part of indigenous biodiversity, as noted in the legal review, so the policy could refer to the intrinsic values of ecosystems as well as those that support other indigenous biodiversity. However, it would be simpler to refer only to indigenous biodiversity, but perhaps highlight particular aspects such as ecosystems, species, and intrinsic values.

Sub-paragraph (3) can be simplified as it currently refers to both 'linking' and 'corridors'. Connectivity could be a better term to use as it is less limiting as to the specific type of connection. Species could possibly also be referred to, as in some cases buffering or connectivity will specifically relate to species rather than habitats or ecosystems.

3.4.3 Suggested text for ECO-P4

The extent, occupancy, and condition of Otago's indigenous biodiversity is increased by:

(1) restoring and enhancing habitat for indigenous species,

(2) improving the health and resilience of indigenous biodiversity, including ecosystems, species, and important ecosystem function, and intrinsic values;

(3) buffering or connecting ecosystems, habitats, and species.

The text highlighted in subparagraph (2) may not be necessary.

3.5 ECO-P5 Wilding conifers

3.5.1 Current policy

The impact of wilding conifers on areas of significant indigenous vegetation and significant habitats of indigenous fauna is reduced by:

(1) preventing the planting of commercial wood species that are prone to wilding confider spread within areas identified as significant areas of indigenous vegetation or significant habitats of indigenous fauna, and
(2) supporting initiatives to control existing wilding conifers and limit their further spread.

The legal review does not provide any comment on the text of this policy, but does note that RPS provisions on wilding conifers can potentially duplicate or conflict with regional pest management plan provisions.

3.5.2 Comments

This policy relates only to the impacts of wilding conifers on significant indigenous vegetation and significant habitats of indigenous fauna. Wilding conifers also affect other indigenous biodiversity and ecosystem functions outside of significant natural areas. The scope of this policy could be widened to 'indigenous biodiversity', to capture these additional effects.

3.5.3 Suggested text for ECO-P5

The impact of wilding conifers on areas on indigenous biodiversity is reduced by:

(1) preventing the planting of commercial wood species that are prone to wilding confider spread within areas of indigenous biodiversity, and
(2) supporting initiatives to control existing wilding conifers and limit their further spread.

4. METHODS - ECO-M2 IDENTIFICATION

4.1 Current provisions

In this section comments are only provided on the practicalities of implementation of the methods that relate to the ecological issues raised in the method ECO-M2 Identification.

Local authorities will:

(1) outside public conservation land, identify the areas specified in ECO-P1 in accordance with the statement of responsibilities in ECO-M1,

(2) recognise that indigenous biodiversity spans jurisdictional boundaries by:
(a) the identification process across that boundary in order to ensure the areas identified are not artificially fragmented when an area has been identified under ECO-P1 or ECO-P2 and spans a jurisdictional boundary, and
(b) ensuring that management frameworks are no less stringent than adjacent districts,
(3) map the areas identified under (1) in the relevant regional and district plans,
(4) in the following areas, undertake identification under (1) and mapping under (3) no later than 2025:
(a) Otago Peninsula,
(b) Moeraki Peninsula,
(c) Catlins coastline,
(d) Braided rivers, including the Makarora, Mātukituki and Lower Waitaki Rivers, and
(e) Tussock grasslands.

4.1.1 Comments

Most of the territorial authorities in Otago have undertaken projects to identify and protect areas of significant indigenous vegetation and significant habitats of indigenous fauna, but none of these assessments have comprehensively identified SNAs, due to resourcing and access issues. Detailed mapping of indigenous vegetation and habitats has been undertaken in Dunedin City District (Wildland Consultants 2020c), and this could be used to facilitate more comprehensive assessment of significant areas, but that exercise has not been undertaken to date. Potential natural ecosystem and current ecosystem mapping undertaken for Otago Regional Council by Wildland Consultants (2020a) includes a considerable amount of mapping of current vegetation, particularly of wetlands. It also includes mapping of the current gravel river beds of the Matukituki and Makarora Rivers, but only small parts of the lower Waitaki River as not much of this river is located in Otago Region. Current ecosystem mapping was mostly based on Land Cover Database version 4.1 (LCDB) polygons, which are known to have issues with from spatial the thematic resolution. The thematic resolution of this mapping was improved by Wildland Consultants (2020a), but approximately 500,000 hectares of current vegetation was nevertheless still mapped using its LCDB classification.

Mapping of tussock grasslands can be technically-challenging and resource-intensive, and warrants further consideration, as addressed below:

- The term ‘tussock grassland’ can be used to refer to both tall tussock (dominated by species of *Chionochloa*) and short tussock (dominated by *Festuca* spp. or silver tussock (*Poa cita*). Tall tussock grassland is generally considered to be of greater ecological importance than short tussock grassland. Short tussock grasslands generally occur in a mosaic of exotic pasture, and in these cases are of relatively low ecological importance, but short tussock grasslands in the inland basin and valley floors can have greater value. If mapping of short tussock grassland is contemplated, this should be restricted to these areas.
- Tall tussock grassland occurs at varying density, but dense stands have greater ecological importance.

- Tall tussock grassland has been extensively fragmented in agricultural landscapes, and may also have a patchy representation in subalpine, and alpine areas. This high degree of fragmentation and patchiness are key factors in what makes mapping of tall tussock grassland more resource-intensive and technically-challenging.
- Tall tussock grassland now occupies a much greater area in Otago than it would have naturally, due to its invasion into montane landscapes following anthropogenic deforestation. There are currently approximately 300,000 hectares more tall tussock grassland in Otago due to human colonisation and modification of Aotearoa/New Zealand.
- While montane tall tussock grassland may be perceived as being related less natural, it nevertheless provides a 'placeholder' for future development of indigenous woody vegetation, helps to buffer wetlands, and provides important connectivity between rock outcrops for threatened indigenous lizards that inhabit these montane environments; e.g. Gebauer *et al.* 2013; Berry *et al.* 2005.
- The pattern of tall tussock grassland depletion is not even across Otago. Tall tussock grassland on higher elevation ranges is more intact and protected than tall tussock grassland on the drier montane ranges of Central Otago (e.g. Rough Ridge), on the foothills of taller ranges, and in uplands of the the Macraes area and eastern hill country. Tall tussock grassland has been reduced significantly in extent in these areas over the last few decades, with the rate of reduction increasing more recently, particularly in Macraes Ecological District and in the Lee Stream area (Cieraad *et al.* 2015). This suggests that the focus of this method should be on tall tussock grassland in the areas where further depletion is most likely to occur, *i.e.* montane environments below *c.*800 metres above sea level.

5. ECO-SCHED1 SIGNIFICANCE CRITERIA

5.1 Current provisions

An area of indigenous vegetation or habitat of indigenous fauna is significant if it meets any one or more of the criteria set out below:

Representativeness	(a) An area that is an example of an indigenous vegetation type or habitat that is typical or characteristic of the natural diversity of the relevant ecological district or coastal marine biogeographic region. This may include degraded examples of their type or represent all that remains of indigenous vegetation and habitats of indigenous fauna in some areas. (b) An indigenous marine ecosystem (including both intertidal and sub-tidal habitats, and including both faunal and floral components) that makes up part of at least 10% of the natural extent of each of Otago's original marine ecosystem types and reflecting the environmental gradients of the *region*. (c) An indigenous marine ecosystem, or habitat of indigenous marine fauna (including both intertidal and sub-tidal habitats, and including both faunal and floral

	components), that is characteristic or typical of the natural marine ecosystem diversity of Otago. (d) A habitat that is important to indigenous species of Otago, either seasonally or permanently, including for migratory species and species at different stages of their life cycle (and including refuges from predation, or key habitat for feeding, breeding, spawning, roosting, resting, or haul out areas for marine mammals). (e) The area contains biological features (habitat species, community) that represent a good example within the relevant coastal marine biogeographic region.
Rarity	(f) An area that supports: (i) An indigenous species that is threatened, at risk, or uncommon, nationally or within an ecological district or coastal marine biogeographic region, or (ii) Indigenous vegetation or habitat of indigenous fauna that has been reduced to less than 20% of its former extent nationally, regionally or within a relevant *land environment,* ecological district, coastal marine biogeographic region or *freshwater environment* including wetlands. (iii) Indigenous vegetation and habitats within originally rare ecosystems. (iv) The site contains indigenous vegetation or an indigenous species that is endemic to Otago or that are at distributional limits within Otago.
Diversity	(g) An area that supports a high diversity of indigenous ecosystem types, indigenous taxa or has changes in species composition reflecting the existence of diverse natural features or gradients.
Distinctiveness	(h) An area that supports or provides habitat for: (i) Indigenous species at their distributional limit within Otago or nationally, or (ii) Indigenous species that are endemic to the Otago *region, or* (iii) Indigenous vegetation or an association of indigenous species that is distinctive, of restricted occurrence, or has developed as a result of an unusual environmental factor or combinations of factors or occurs within an originally rare ecosystem.
Ecological Context	(i) The relationship of the area with its surroundings (both within Otago and between Otago and the adjoining regions), including: (i) An area that has important connectivity value allowing dispersal of indigenous vegetation and fauna between different areas;

	(ii) An important buffering function that helps to protect the values of an adjacent area or feature; (iii) An area that is important for indigenous fauna during some part of their life cycle, either regularly or on an irregular basis, e.g. for feeding, nesting, breeding, or refuges from predation. (iv) A *wetland* which plays an important hydrological, biological or ecological role in the natural functioning of a *river* or coastal ecosystem.
Interactions	(j) The site or area has indigenous biodiversity of significance to Kai Tahu. (k) The site or area is important for human interactions with, and appreciation of, indigenous biodiversity.
Sustainability	(l) The site is ecologically resilient, i.e. its natural ecological integrity and processes (functioning) are largely self-sustaining.

5.2 Comments

5.2.1 Representativeness

The Representativeness criterion has five subcriteria, a-e, and comments are provided below on each of these.

Subcriterion (a)

Sub-criterion (a) is similar to the various versions of the Representativeness criterion defined in current regional and district plans elsewhere in New Zealand. As written, it does not contain a standard or baseline against which the assessment of typical or characteristic can be made. Many plans previously used an historic baseline, for example a pre-human baseline, or an 1840 baseline. The latter was used because there were at least some early descriptions of the vegetation present at that time and indications of extent. Pre-human baselines were more problematic due to a lack of suitably resolved information on the pre-human vegetation pattern. This has now changed, with potential natural ecosystem mapping now undertaken widely across Aotearoa/New Zealand, using a consistent classification of indigenous vegetation (Singers and Rogers 2014). As this has now been done for Otago (Wildland Consultants 2020a), the potential natural ecosystem map for Otago constitutes the best historic baseline available for the natural vegetation of Otago.

Representativeness addresses the natural diversity of an area. Some experts suggest that Representativeness should be based on current indigenous vegetation patterns. Much of the current vegetation across Otago and other regions is often strongly modified or secondary in nature and, while it is indigenous and has been established through 'natural' processes, does not constitute the original vegetation cover of an area. As noted above, some 300,000 hectares of tussock grassland occurs below treeline in Otago, where indigenous forest is the natural vegetation cover. This snow tussock grassland may be significant for other reasons, but not necessarily for Representativeness of the original natural vegetation cover.

A Representativeness criterion utilising an historic baseline targets those ecosystem types that are the most consistent in structure and composition with the historic state. For example, broadleaved forest with emergent podocarps, or harakeke (*Phormium tenax*)-dominant wetlands in lowland valleys. These ecosystem types, which have a high representativeness rating based on an historic baseline, may no longer be typical or characteristic in the present day.

To make the need for an historic baseline clear, the word 'original' could be inserted before 'natural diversity'

Subcriterion (b)

Subcriterion (b) relates to the marine environment and captures ecosystems that *"make up part of at least 10% of the natural extent of each of Otago's original marine ecosystem types and reflecting the environmental gradients of the region".*

More extensive marine ecosystem types would be captured by this criterion, *i.e.* those that make up part of 10% or more of the natural extent of Otago's original marine ecosystem types. The only ecosystems that would not be captured are those that make up less than 10% of their original natural extent. Generally, where percentage thresholds are used for ecosystems, they are part of the Rarity criterion, and are stated in a way that captures examples of ecosystems that are reduced in extent below the threshold. The intent of subcriterion (b) is not entirely clear, and it could be restated under Rarity.

It is not clear how the final part of the sub-criterion, - "… *reflecting the environmental gradients of the region"* - would be interpreted. It could be interpreted as a qualifier to limit the assessment only to marine ecosystems that are part of marine gradients. It appears to be an attempt to address a different value - environmental gradients - under the representativeness criterion, and should be omitted, since this is already addressed under the Diversity criterion.

Subcriterion (b) has wide scope, including both intertidal and subtidal areas, and both fauna' and flora' assemblages. This is particularly important in the marine environment, where benthic fauna can form marine ecosystems, and is also reflected in subcriterion (c).

Subcriterion (d) would be best addressed under Ecological Context, where it is partially duplicated in any case.

Subcriterion (e) refers to "good examples" and is likely to be subject to variable interpretation. It duplicates subcriterion (b) in that characteristic or typical examples of the original marine ecosystem diversity are also likely to be 'good examples.

5.2.2 Rarity

The Rarity criterion has four subcriteria, which are typical of those included under Rarity in ecological significance criteria sets in other regional and district plans.

Subcriterion (i)

Under subcriterion (i), any area that supports a species that is classified as threatened, at risk, or uncommon could be captured as significant. It requires expert judgement to assess an area(s) as being not significant when they contain low numbers of at risk or uncommon species, or where a species that is at risk nationally, is very common regionally, e.g. matagouri (*Discaria toumatou*) has a current threat classification of At Risk-Declining. One solution to this is to require a higher threshold for the capture of at risk and uncommon species, for example by restricting ecological significance to important populations of such species.

Subcriterion (ii)

Subcriterion (ii) refers to indigenous vegetation and habitats of indigenous fauna that have been reduced to less than 20% of their original extent, at a variety of scales. Mapping of potential natural ecosystems for Otago (Wildland Consultants 2020a) provides a useful basis for assessment of the extent and the level of reduction of terrestrial and wetland ecosystem types.

Subcriterion (iii)

Subcriterion (iii) refers to 'Originally rare ecosystems'. It should be noted that these were originally defined as 'historically rare ecosystems' (Williams *et al.* 2007) and more recently as 'naturally uncommon ecosystems' (Holdaway *et al.* 2012), and these terms are synonymous for the same thing.

Subcriterion (iv)

Subcriterion (iv) does not need to refer to endemic taxa or distribution limits of taxa, as these are covered and better-expressed under Distinctiveness.

5.2.3 Diversity

The Diversity criterion is appropriate and does not require any modification.

5.2.4 Distinctiveness

Distinctiveness subcriterion (iii) does not need to refer to originally rare ecosystems as these are covered under the Rarity criterion.

5.2.5 Ecological context

The Ecological Context criterion is important for the capture of significant habitats of indigenous fauna.

Subcriterion (ii) needs to refer to an area.

Subcriterion (iii) should include an attribute which would cover aspects such as staging areas for seasonal migrations, high tide roosts for wading birds, and haul-out sites for

marine mammals. A ‘spawning’ attribute may also be warranted to make this explicit, but would be captured under ‘breeding’.

5.2.6 Interactions

Ecological significance criteria generally refer to RMA Section 6(c) and relate to significant indigenous vegetation and significant habitats of indigenous fauna. The proposed Interactions criterion captures sites and areas of indigenous biodiversity of significance to Kai Tahu, and areas that are important for human interaction with and appreciation of indigenous biodiversity. As neither of these are Section 6(c) matters, they should be dealt with in other parts of the Proposed RPS.

5.2.7 Sustainability

Sustainability criteria were promoted in the 1980s through to the early 2000s (*e.g.* Norton and Roper-Lindsay 2004), but were subsequently have not been supported as resilience often relates strongly to management of sites, and is not an intrinsic feature of an area of indigenous vegetation or habitat. For example, an area of indigenous forest may not be very resilient if it is open to stock browsing, but if fenced to exclude stock, can regain its ecological integrity and processes, and be very resilient and sustainable.

5.3 Suggested significance criteria

Suggested changes to the draft criteria set are made in the table below using underlining for text that has been added, and ~~strikethrough~~ for text that has been deleted.

Representativeness	(a) An area that is an example of an indigenous vegetation type or habitat that is typical or characteristic of the original natural diversity of the relevant ecological district or coastal marine biogeographic region. This may include degraded examples of their type or represent all that remains of indigenous vegetation and habitats of indigenous fauna in some areas. (b) An indigenous marine ecosystem, or habitat of indigenous marine fauna (including both intertidal and sub-tidal habitats, and including both faunal and floral assemblages ~~components~~), that is characteristic or typical of the original natural marine ecosystem diversity of Otago. ~~(d) A habitat that is important to indigenous species of Otago, either seasonally or permanently, including for migratory species and species at different stages of their life cycle (and including refuges from predation, or key habitat for feeding, breeding, spawning, roosting, resting, or haul out areas for marine mammals).~~ ~~(e) The area contains biological features (habitat species, community) that represent a good example~~

~~within the relevant coastal marine biogeographic region.~~

Rarity

(c) An area that supports:

(i) An indigenous species that is threatened, at risk, or uncommon, nationally or within an ecological district or coastal marine biogeographic region, or

(ii) Indigenous vegetation or habitat of indigenous fauna that has been reduced to less than 20% of its former extent nationally, regionally or within a relevant land environment, ecological district, coastal marine biogeographic region or freshwater environment including wetlands.

(iii) Indigenous vegetation and habitats within originally rare ecosystems.

~~(iv) The site contains indigenous vegetation or an indigenous species that is endemic to Otago or that are at distribution limits within Otago.~~

Diversity

(d) An area that supports a high diversity of indigenous ecosystem types, indigenous taxa or has changes in species composition reflecting the existence of diverse natural features or gradients.

Distinctiveness

(e) An area that supports or provides habitat for:

(i) Indigenous species at their distributional limit within Otago or nationally, or

(ii) Indigenous species that are endemic to the Otago region, or

(iii) Indigenous vegetation or an association of indigenous species that is distinctive, of restricted occurrence, or has developed as a result of an unusual environmental factor or combinations of factors ~~or occurs within an originally rare ecosystem~~.

Ecological Context

(i) The relationship of the area with its surroundings (both within Otago and between Otago and the adjoining regions), including:

(i) An area that has important connectivity value allowing dispersal of indigenous ~~vegetation~~ flora and fauna between different areas;

(ii) An area that has an important buffering function that helps to protect the values of an adjacent area or feature;

(iii) An area that is important for indigenous fauna during some part of their life cycle, either regularly or on an irregular basis, e.g. for feeding, resting,

	nesting, breeding, spawning, or refuges from predation. (v) A wetland which plays an important hydrological, biological or ecological role in the natural functioning of a river or coastal ecosystem.
~~**Interactions**~~	~~(j) The site or area has indigenous biodiversity of significance to Kai Tahu.~~ ~~(k) The site or area is important for human interactions with, and appreciation of, indigenous biodiversity.~~
~~**Sustainability**~~	~~(l) The site is ecologically resilient, i.e. its natural ecological integrity and processes (functioning) are largely self-sustaining.~~

6. CONCLUSIONS

Comments have been provided primarily in relation to the proposed objectives, policies, and significance criteria in the indigenous biodiversity chapter of the Proposed RPS, along with, discussion of mapping information and mapping issues relevant to evaluation methods. Recent advances in mapping of current ecosystems and potential natural ecosystems in Otago and in Dunedin City District are potentially very useful for identification and mapping of areas of significant indigenous vegetation and significant habitats of indigenous fauna, and provide a basis for assessment of criteria for Representativeness and Rarity. The currently proposed significance criteria set contains some duplication and includes two criteria that do not relate to Section 6(c) of the RMA, and seem out of place in this chapter. Suggestions have been provided to improve the other significance criteria by removing duplication and tightening of the scope for each criterion, to ensure that they are more appropriate.

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