

**IN THE MATTER** of the Resource  
Management Act 1991

**AND**

**IN THE MATTER** of the Proposed One Plan  
notified by the Manawatu-  
Wanganui Regional Council,  
hearing related to  
Biodiversity & Heritage

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**SUPPLEMENTARY STATEMENT OF EVIDENCE OF WILLIAM BRUCE SHAW**

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**INTRODUCTION**

1. Since my previous evidence was prepared I have participated in a pre-hearing caucusing meeting with other relevant witnesses, held on 11 August 2008.
2. I have read the additional 'Evidence and supplementary recommendations' of Fleur Maseyk dated 3 November 2008 and the 'Introductory statement and supplementary recommendations' of Helen Marr, dated 24 October 2008. I have also read the 4 November version of the Glossary, the 5 November versions of Chapters 7 and 12, and the revised Schedule E as attached to Ms Maseyk's 'Evidence and supplementary recommendations'.
3. As stated in my Evidence in Chief, I have read and agree to comply with the Code of Conduct for Expert Witnesses.

**SCOPE OF SUPPLEMENTARY EVIDENCE**

4. My supplementary evidence now addresses various provisions of the documents referred to above.
5. There have been many substantial changes recommended to the parts of the Proposed One Plan that address biodiversity issues and, because of this, my supplementary evidence only addresses the documentation received since my original evidence was prepared and submitted.

## **SUMMARY OF SUPPLEMENTARY EVIDENCE**

6. My evidence in chief addressed the wording of Objective 7-1 and various aspects of Schedule E. I have subsequently attended a caucusing meeting of relevant experts and many of my original concerns have been addressed in the supplementary evidence of Ms Fleur Maseyk for Horizons Regional Council.
7. I support most of the changes recommended by Ms Maseyk and I have provided further suggested changes, to clarify provisions in the Plan and to avoid potential confusion.
8. Policies 7-1 and 7-4(a) would benefit from some rewording.
9. I am still of the opinion that Policy 7-1 should be simplified. I support provision of opportunity for ecological enhancement in this policy.
10. Policy 12-7 can be improved by placing one of the criteria listed under 'Ecological Context' under 'Representativeness'.
11. Policy 12-7 would have greater certainty if the particular documents relating to threatened species were to be specified.
12. I generally support the recommended use of the new Table E.1 provided in the evidence of Ms Fleur Maseyk. The Table can, however, be improved by some rewording of definitions, to make them clearer, and by some restructuring. An amended version of the Table showing my recommended changes to a number of the definitions is attached to my supplementary evidence.
13. Application of Table E.2(a) requires the reinstatement of the definitions for 'forest', 'herbfield', 'rushland', 'scrub', 'shrubland', 'tussockland', and 'treeland', which have been deleted from the Glossary.
14. Table E.2(b) can be improved by inclusion of the additional exclusions:

### **"Dunelands and Sand Country**

xii Plantation forest on sand

- xiii Intensively grazed pasture dominated by exotic grasses and other exotic herbaceous species and lacking a significant indigenous element.

This would exclude the intensively developed pastoral and forestry land uses that now occur widely on sand country.

## **OBJECTIVES AND POLICIES**

15. The current wording of Objective 7-1: Indigenous biological diversity is:

*~~“The existing level of Indigenous biological diversity is maintained or enhanced by: into the future by ensuring that:~~*

*(a) Protecting Rare and Threatened Habitats\*;*

*(b) Maintaining At-Risk Habitats\*; and*

*(c) Enhancing the function of the best representative examples of Rare and Threatened Habitats”, and At-Risk Habitats\*.”*

16. I support the intent of this objective as it now allows for the enhancement (i.e. improvement of the status quo) of indigenous biodiversity, as well as protection and maintenance (i.e. retention of the status quo). It does seem limiting however, that all of these worthwhile initiatives - protection, maintenance, and enhancement - are confined only to ‘rare and threatened’ and ‘at risk’ habitats. While I understand the relative priority of protecting and enhancing these particular habitat types - as defined in Schedule E1 - I consider that the scope of Objective 7-1 is unnecessarily narrow.
17. I consider that it would be appropriate to widen the scope for the maintenance or enhancement of all indigenous biological diversity by deleting (a)-(c) from Objective 7-1. I also support the inclusion of the word “Net” at the beginning of the objective for the reasons outlined in Mr Peterson’s evidence.
18. However, if clauses (a)-(c) are retained, the term ‘representative’ should be deleted from (c), for reasons which I address in the section below.

## **POLICY 7-4(a)**

19. Policy 7-4(a) 'Proactive management of representative habitats' is currently worded:

*“(a) The Regional Council ~~will~~ shall aim to improve the health and function of the best representative examples of rare and threatened habitats\* and at-risk habitats\* by working in partnership with relevant landowners and other parties with a legal interest in the land to establish a plan and incentive programme for the voluntary proactive management of each of these areas by 2016.”(Recommendations for amendment by Council Officers underlined).*

20. I support the intent of this policy (and Policies 7-4(b) and 7-4(c)), but I consider that the use of the term “best representative examples” (my underline) in this policy and in Objective 7-1 introduces unnecessary potential for confusion. The term “representativeness” is defined in Table 2 of Fleur Maseyk’s evidence and supplementary recommendations (page 23) and consequently in Policy 12-7 as:

*“The site comprises habitat type that is under-represented (20% or less of known or likely former cover).”*

21. In my opinion the word “representativeness” as used in Objective 7-1 and Policy 7-4(a) is not intended to have the same meaning as it is given in Policy 12-7. I consider that that use of the word “representative” in Objective 7-1 and Policy 7-4(a) is not necessary to achieve what is being sought, and its removal will help avoid potential confusion. I recommend that the word “representative” is removed from Objective 7-1 and Policy 7-4(a).
22. The definition of representativeness contained in Table 2 (page 23) of Fleur Maseyk’s evidence and consequently in Policy 12-7 is one possible definition of this criterion. Alternative definitions tend to refer to large good quality examples of indigenous vegetation, similar to the last bullet point (i.e. 6th) under the ‘Ecological Context’ criterion shown in Table 2 of Fleur Maseyk’s evidence and supplementary recommendations and consequently in Policy 12-7.

23. In my opinion, this particular criterion is out of place being listed under 'Ecological Context' and should be moved to the 'Representativeness' criterion in Table 2.
24. I consider that the word 'representative' should be removed from Objective 7-1 and Policy 7-4(a), regardless of whether the definition of representativeness in Policy 12-7 is altered in the way that I have suggested.

### **WATER TAKES AND DISCHARGES**

25. In relation to Rules 12-1, 12-7, 12-8, and 12-9, Mighty River Power would like to reserve its position on these at this stage as it intends to address the effects of water takes, diversions and discharges in more detail at the water hearing to be held in mid 2009.

### **OTHER COMMENTS ON POLICY 12-7**

26. I suggest the inclusion of the Table contained in proposed Policy 12-7 of the plan subject to minor amendments.
27. The first bullet point under the 'Rarity and Distinctiveness' criterion includes reference to the 'current New Zealand Threat Classification System and Lists'. I have been advised, that the term "current New Zealand Threat Classification System and Lists" relates to the currently existing Lists, and that if technical documents are to be incorporated in the Plan by reference then there must be certainty over exactly what is to be incorporated by reference. If this is the case, then subsequent revisions of the Threat Classification System and Lists will not automatically become part of the One Plan. There will need to be a plan change or variation to enable this to occur.
28. It is likely that several relevant revisions will be required during the 10 year life of the One Plan.
29. The current threatened species Lists - Hitchmough 2007 and de Lange 2004 - are based on the system developed by Molloy and Davis (2002), as was the previous iteration of the Lists (Hitchmough 2002). A new system

(Townsend *et al.* 2008) was released earlier this year and future threatened species lists will be based on that system. I have also been informed that the Department of Conservation, which convenes reviews of the Lists, apparently intends to progressively review defined requirements of the numerous Lists that are currently included in Hitchmough *et al.* (2007), rather than to review the full suite of taxonomic groups at the same time, as per Hitchmough *et al.* (2007). In my opinion, the specific documents that should be listed as being incorporated into the Plan by reference are:

de Lange P.J., Norton D.A., Heenan P.B., Courtney S.P., Molloy B.P.J., Ogle C.C., Rance B.D., Johnson P.N. and Hitchmough R. 2004: Threatened and uncommon plants of New Zealand. *New Zealand Journal of Botany* 42: 45-76.

Hitchmough R., Bull L. and Cromarty P. (comps) 2007: New Zealand Threat Classification System Lists - 2005. Department of Conservation, Wellington. 194 pp.

Molloy J., Bell B., Clout M., de Lange P., Gibbs G., Given D., Norton D., Smith N. and Stephens T. 2002: Classifying species according to threat of extinction. A system for New Zealand. *Threatened Species Occasional Publication* 22. Department of Conservation, Wellington. 26 pp.

Townsend A.J., de Lange P.J., Duffy C.A.J., Miskelly C.M., Molloy J. and Norton D.A. 2008: New Zealand threat classification system manual. Department of Conservation, Wellington. 35 pp.

### **COMMENTS ON TABLE E.1 (REVISED SCHEDULE E)**

30. As noted in the evidence and supplementary recommendations of Ms Fleur Maseyk, Schedule E “has been considerably reworked in terms of content and structure”, to improve ‘clarity, content, and usability’. The recommended changes made include:

- clarity of habitat type definitions;
- more detailed habitat type descriptions;
- improved use of references; and
- general layout.

31. Various habitat types have also been added to Schedule E. I support the changes to the general layout, the increased use of references, the provision of more detailed habitat type descriptions, and improvements in the clarity and habitat type definitions as these all help to make the plan more user-friendly with a greater degree of certainty.
32. I do, however, have some suggested changes on the definitions, which are tracked in the version of Table E.1 attached to my evidence. In my opinion the changes suggested will improve clarity of the definitions.

### **COMMENTS ON TABLE E.2 (a)**

33. I have the following comments on this table.
34. The table is now divided into the following habitat types:
- Forest habitat type classified as 'Threatened' or 'At Risk';
  - Riparian habitat type classified as 'At Risk';
  - Grassland habitat type classified as 'At Risk';
  - Naturally rare habitat type and wetland habitat type classified as 'Rare'.
35. The term 'Riparian habitat type classified as At Risk' is defined, within Table E.2 and I support that definition and its inclusion in the Table.
36. However, a number of other technical terms that were previously defined in the Proposed One Plan Glossary are no longer defined as the previous definitions have now been deleted. In my opinion definitions are still required for 'forest', 'herbfield', 'rushland', 'scrub', 'shrubland', 'tussockland', 'treeland' and 'grassland'. Definitions for all these technical terms should be included in either the main Glossary or the glossary attached to Revised Schedule E, as attached to Ms Maseyk's 'Evidence and supplementary recommendations'. In my view the definitions previously contained in the main Glossary remain appropriate.
37. The use of the term 'treeland', in clauses (iii) - (v), is also possibly out of place as it is used under the heading 'forest', but 'forest' has a separate

definition to 'treeland'. Treeland can be regarded as being a subset of forest but the definitions in the Plan are quite distinct.

38. 'Naturally rare' habitat types are referred to in Table E.2 but are not defined in any glossary. They are, however, defined in Table E.1 by reference to Williams *et al.* 2006 and Williams *et al.* 2007. The same approach is used for wetlands, which are defined in Table E.1 by reference to Johnson & Gerbeaux 2006. I note that there is also a definition of 'wetland' in the Resource Management Act 1991. Definition of all these terms should be provided in a glossary, to reduce uncertainty about how the plan is to be interpreted.

### **COMMENTS ON TABLE E.2(b)**

39. This table provides a set of criteria for exclusions of 'forest habitat type classified as Threatened or At Risk' and 'wetland habitat type classified as Threatened', from consideration as a habitat for the purposes of the Plan.
40. I support the exclusions, although I note that the term 'treeland' is also used under 'forest' in clause (i) of Table E.2(b), which could possibly create confusion.
41. There would be merit, in my view, in clarifying what is included (and excluded from) the term 'duneland' used in Table E.1 (with three categories: active duneland, stable duneland, inland duneland). There are still large areas of 'stable' and 'inland' duneland on the Manawatu and Horowhenua Plains that have been converted to other land uses; primary grazed pasture but also plantation forest. I suggest that it would be useful to provide the following addition to Table E.2, to exclude dunelands and sand country planted in exotic vegetation:

#### **"Dunelands and Sand Country**

*xii Plantation forest on sand*

*xiii Intensively grazed pasture dominated by exotic grasses and other exotic herbaceous species and lacking a significant indigenous element, located on sand."*

## **GLOSSARY PROVIDED IN MASEYK EVIDENCE**

33. I support the provision of definition for technical terms in this glossary (and in the main Proposed One Plan glossary) as they increase certainty for future interpretation of the One Plan.
34. Relevant technical definitions - such as 'forest', 'treeland', 'rushland' and so on could be transferred from the main Proposed One Plan glossary or they could be left where they are and the 'Maseyk Glossary' could be transferred to the main One Plan glossary. If the latter approach is used, each of the Maseyk definitions should be prefaced by the statement: "*For the purpose of Schedule E*".

## **DEFINITION OF INDIGENOUS VEGETATION**

35. 'Indigenous vegetation' is explained in the introduction to Schedule E as shown at paragraph 2 on Page 34 of Ms Maseyk's evidence. The second sentence need to be reworded to read: "Indigenous vegetation .....", rather than "Indigenous habitat ....".

## **CONCLUSIONS**

36. The approach set out in the notified Proposed One Plan had significant problems associated with it and would create considerable uncertainty and tensions for resource users and, in my view, for regional council staff applying the plan.
37. These problems have been recognised and most have been addressed in the evidence and supplementary recommendations of Ms Maseyk, for Horizons Regional Council. I concur with most of the changes recommended by Ms Maseyk and have suggested additional ones, which I suggest will help to improve certainty of interpretation and implementation of the Proposed One Plan to achieve its biodiversity objectives.

## **REFERENCES**

de Lange P.J., Norton D.A., Heenan P.B., Courtney S.P., Molloy B.P.J., Ogle C.C., Rance B.D., Johnson P.N. and Hitchmough R. 2004: Threatened and

- uncommon plants of New Zealand. *New Zealand Journal of Botany* 42: 45-76.
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- Hitchmough R., Bull L. and Cromarty P. (comps) 2007: New Zealand Threat Classification System lists - 2005. Department of Conservation, Wellington. 194 pp.
- Johnson P. and Gerbeaux P. 2004: Wetland Types in New Zealand. Department of Conservation, Wellington.
- Molloy J., Bell B., Clout M., de Lange P., Gibbs G., Given D., Norton D., Smith N. and Stephens T. 2002: Classifying species according to threat of extinction. A system for New Zealand. *Threatened Species Occasional Publication* 22. Department of Conservation, Wellington. 26 pp.
- Townsend A.J., de Lange P.J., Duffy C.A.J., Miskelly C.M., Molloy J. and Norton D.A. 2008: New Zealand threat classification system manual. Department of Conservation, Wellington. 35 pp.
- Williams P.A., Wiser S., Clarkson B. and Stanley M. 2006: A physical and physiognomic framework for defining and naming originally rare terrestrial ecosystems: first approximation. *Landcare Research Internal Report LC0506/185*. Landcare Research New Zealand Ltd.
- Williams P.A., Wiser S., Clarkson B. and Stanley M. 2007: New Zealand's historically rare terrestrial ecosystems set in a physical and physiognomic framework. *New Zealand Journal of Ecology* 31(2): 119-128.

Please note that my recommended amendments are underlined, while any deletions have been struck through.

Habitat Type Name	Defined As	Classification	Further Description
Forest Habitat Type			
Hardwood/broadleaved forest	<p>Tawa-dominant forest, <u>where tawa occurs</u> in association with <u>other broadleaved species</u>.</p> <p>Hardwood/broadleaved forest is described as <u>part of</u> Kauri/taraire-kohekohe-tawa forest in Leathwick et al. 2005<sup>1</sup>. <u>Note that kauri, taraire, and kohekohe do not occur naturally in the region.</u></p>	Threatened	<p>Kamahi, hinau and black maire are also likely to be common*. Podocarp species such as kahikatea, rimu or totara may be emergent <u>above the canopy</u>. Titoki, rewarewa or northern rata may also be a feature. The subcanopy is likely to comprise common broadleaved species.</p> <p>This habitat type is found in hillcountry north of Wanganui and the east coast at elevations of 0-150 m asl.</p>
Kahikatea-pukatea-tawa forest	<p>Kahikatea-dominated forest on lowland alluvium and floodplains, commonly found in association with pukatea and tawa.</p> <p>Kahikatea-pukatea-tawa forest is described in Leathwick et al. 2005<sup>1</sup></p>	Threatened	<p>This habitat type is likely to be characterised by the presence of the swamp forest species kahikatea and pukatea. Tawa will be common on the drier, better drained or raised areas. Matai, rimu and totara can be present but are restricted to areas of better-drained soils. Titoki is also likely to be common.</p> <p>Kahikatea-pukatea-tawa forest is found on alluvial soils throughout the Region predominantly at elevations between 0 – 350 m but also up to 650 m asl.</p>
Podocarp forest	<p>Podocarp forest dominated by matai, kahikatea or totara.</p> <p>Podocarp forest is described as Mata-ikahikatea-totara forest in Leathwick et al., 2005<sup>1</sup></p>	Threatened	<p>The dominance of any of these species is dependent on the drainage capability of the soil and history of past disturbance. Totara and matai are likely to be more abundant on free-draining soils, with kahikatea likely to be dominant on poorly drained soils. Broadleaved species (for example titoki, tawa, maire and fuchsia) are likely to be found in association with the podocarp species, but will be less abundant than the podocarp species.</p> <p>Podocarp forest is mostly confined to the Wanganui, Rangitikei and Ruapehu Districts from sea level to 900 m asl.</p>
Podocarp/broadleaf-fuchsia forest	<p>Dominated by podocarp species (matai, totara, kahikatea or rimu, <u>at varying levels of abundance to varying degrees</u>) with a lower subcanopy of broadleaf and fuchsia.</p> <p>Podocarp/broadleaf-fuchsia forest is described as Matai-totara-kahikatearimu/broadleaf-fuchsia forest in Leathwick et al., 2005<sup>1</sup></p>	Threatened	<p>This habitat type tends to favour adequately drained and reasonably fertile soils. Although typically a feature of this habitat type, fuchsia is favoured by possums and may be uncommon in many areas. Broadleaf (Griselinia), climbers and epiphytes are also likely to be common. Kamahi may also be present but typical broadleaved species may be lacking.</p> <p>This habitat is largely confined to small isolated areas in high rainfall areas of the hillcountry in Ruapehu, Wanganui, Tararua and Manawatu Districts from 400 – 900 m asl.</p>

Habitat Type Name	Defined As	Classification	Further Description
Podocarp/tawa-mahoe forest	<p>Tawa and mahoe dominated forest, <u>with scattered emergent podocarps.</u></p> <p>Podocarp/tawa-mahoe forest is described as Kahikatea-matai/tawa-mahoe forest in Leathwick et al., 2005.</p>	Threatened	<p>Kahikatea and/or matai trees are likely to be present in the canopy or as emergent trees. Rimu and totara may also be present in low numbers. Titoki, hinau, mairie or pukatea may also be present. The subcanopy is likely to comprise common broadleaved species.</p> <p>This habitat type is found on dry dune land and low hillcountry (from sea level to 750 m asl)</p>
Rimu/tawa-kamahi forest	<p>Tawa and kamahi dominated forest, <u>with scattered emergent rimu.</u></p> <p>Rimu/tawa-kamahi forest is described in Leathwick et al., 2005.</p>	Threatened	<p>Hinau, rewarewa or mahoe are likely to be common. Rimu may be a feature of this habitat type, although its frequency will be dependent on the history of disturbance of the site. Miro and totara may also be present with kahikatea and matai likely to be less common. Pukatea is commonly likely to be present, particularly in valleys. Black beech may be locally common on dry ridges in hillcountry (eg. inland from Wanganui). Common broadleaved species are also likely to be present in the understory.</p> <p>Rimu/tawa-kamahi forest can be found in all Districts of the Region from sea level to 800 m asl.</p>
Podocarp/kamahi forest	<p>Podocarp forest dominated by rimu, miro, kahikatea, matai or totara in varying dominance over abundant kamahi.</p> <p>Podocarp/kamahi forest is described as Rimu-matai-miro-totara/kamahi forest and Rimu-miro-totara/kamah iforest in Leathwick et al., 2005.</p>	At Risk	<p>The degree of dominance of each of the podocarp species will be dependent on soil drainage and past disturbance history. Totara, miro and matai are likely to be more abundant on free-draining soils, with kahikatea likely to be dominant on poorly-drained soils. Rimu will likely dominant in areas of high rainfall. Tawa, northern rata, hinau, black and white mairie, fuchsia and/or mahoe may also be present.</p> <p>Podocarp/kamahi forest can be found throughout the region, excluding the western lowland area, predominantly at elevations between 150 – 900 m asl. However, Podocarp/kamahi forest can be found between 50 – 1100 m asl.</p>

Habitat Type Name	Defined As	Classification	Further Description
Hall's totara/broadleaf forest	<p>Hall's totara and broadleaf dominant forest found in montane sites lacking beech.</p> <p>Hall's totara/broadleaf forest is described in Leathwick et al., 2005'</p>	At Risk	<p>Pahautea can be co-dominant in this habitat type, but is absent from the northern Tararua Ranges, where mountain toatoa is likely to be locally common. Matai and miro can be present at the lower altitudes of the range of this in this habitat type. Kamahi can also be a component of this habitat type, and will be more common in wetter climates. Rimu is not a feature of this habitat type as Hall's totara/broadleaf forest is mostly found above the altitudinal limit of rimu.</p> <p>Hall's totara/broadleaf forest is the dominant habitat type above 800 m asl where beech is absent, but can also be found to elevations as low as 450 m asl.</p>
Podocarp/red beech-kamahi-tawa forest	<p>Red beech, kamahi and tawa dominated forest found in mid-altitudinal zones (400 – 700 m asl).</p> <p>Podocarp/red-beech-kamahi-tawa forest is described as Rimu-miro/tawari-red beech-kamahi-tawa forest in Leathwick et al., 2005'</p>	Threatened	<p>Podocarp species such as rimu, Hall's totara, and miro may be present scattered through the canopy, or as emergent trees. Broadleaved species may also be present in the subcanopy and understorey. At the higher altitudes of the range of this habitat type, silver beech becomes increasingly dominant.</p> <p>Podocarp/red beech-kamahi-tawa forest is largely confined to the Rang_2b Water Management Sub-zone and can be found from 400 – 700 asl.</p>
Podocarp/black beech/mountain beech forest	<p>Black beech and mountain beech dominated forest found at in mid-altitudinal zones (400 – 1250 m asl).</p> <p>Podocarp/black beech/mountain beech forest is described as Mataitotara/ black beech/mountain beech forest in Leathwick et al., 2005'</p>	Threatened	<p>Emergent podocarp species (eg. matai, totara, kahikatea, rimu or miro) can be present as emergent trees, but are not dominant. Small broadleaf trees are also likely to be present.</p> <p>This habitat type can be found mostly at mid-altitudinal zones, (with a range of between 400 – 1250 m asl) in dry climates, on free draining, relatively fertile soils.</p>
Hall's totara/silver beech-kamahi forest	<p>Silver beech-dominant forest, commonly in association with abundant high abundance of kamahi.</p> <p>Hall's totara/silver beech-kamahi forest is described as Hall's totara/silver beech-kamahi-southern rata in Leathwick et al. 2005'</p>	Threatened	<p>Podocarp species such as Hall's totara, pahautea, totara, rimu, and miro are likely to be emergent at lower elevations of the range of this habitat-type where the silver beech is less dominant. Northern rata may be scattered throughout, although its relative abundance is effects will be strongly influenced by the presence effects (current or and historic) of possums.</p> <p>This habitat type is found at high elevations (750 – 1400 m asl) in the montane areas of the Rangitikei and Manawatu districts.</p>

Habitat Type Name	Defined As	Classification	Further Description
Mountain beech forest	<p>Mountain beech dominant forest is <del>dominated by mountain beech</del>, often occurring without many other tree species.</p> <p>Mountain beech forest is described in Leathwick et al, 2005<sup>1</sup></p>	At Risk	<p><del>Upland mountain</del> conifers (eg. Hall's totara, pahautea, and mountain toatoa) and other species (eg. silver beech, broadleaf) may be present (but not common) in places, especially at lower elevations or where rainfall is higher. The understorey of mountain beech forest is typically sparse. Mountain beech can tolerate cold temperatures, dry winds, and thinner, less fertile soils.</p> <p>Mountain beech forest can be dominant at higher altitudes (650 – 1450 m asl), especially on eastern sites and in areas <del>of</del> with harsh (stress-prone) environmental conditions.</p>
Kowhai-broadleaved forest	Forest dominated by kowhai, <del>growing</del> on river terraces, river risers or cliffs and bluffs associated with rivers.	Threatened	<p>Kowhai-broadleaved forest is typically low-growing forest, often with a mixture of small tree species and shrubs including lacebark, ribbonwood, kanuka, and divaricating shrubs.</p> <p>The absence of a dense canopy of tawa or kamahi from these forests is notable.</p> <p>This habitat type is found in the central area of the Region, within the following Water Management Sub-zones: Akit_1a, Akit_1b, Akit_1c, Mana_1a, Mana_1b, Mana_1c, Mana_7a, Mana_7b, Mana_7c, Mana_7d, Mana_12d, Rang_2b, Rang_2e, Rang_2f, Rang_2g, Rang_3a, Rang_3b, Rang_4c, Whai_6, Whai_7a, Whai_7c, Whai_7d, Whau_2, Whau_3a, Whau_3e, Tura_1a, Tura_1b.</p>
Kanuka forest	Kanuka forest is dominated by almost pure stands of well-developed kanuka. Kanuka forest can be differentiated from kanuka scrub by size (greater than 4.5 m tall or 20 cm diameter (taken at diameter at breast height (dbh)).	Threatened	Manuka and common broadleaved species can also be present scattered through the canopy or understorey but will not be dominant.

Habitat Type Name	Defined As	Classification	Further Description
Forest or scrub habitat on alluvial terraces, floodplains, shingle fans or sand dunes supporting divaricating plant species	<p>Forest or scrub <del>growing</del> on alluvial terraces or floodplains in areas prone to summer drought and water-logging and frost during winter that provides habitat for any of the following:            Gardners tree daisy (<i>Olearia gardnerii</i>),            heart-leaved kohuhu (<i>Pittosporum obcordatum</i>),  <i>Coprosma obconica</i>,  <i>Coprosma wallii</i>,  <i>Melicytus flexuosus</i>,            fierce lancewood (<i>Pseudopanax ferox</i>),</p> <p>OR</p> <p>Forest or scrub <del>growing</del> on freely draining shingle fans, river terraces and sand dunes that provides habitat for matagouri (<i>Discaria taumatou</i>).</p>	At Risk	<p>This habitat type supports threatened or regionally uncommon divaricating plant species.</p> <p>This habitat type may be <u>the result of disturbance</u> (naturally or human induced), contain exotic species, or other divaricating species than those listed here, or be found in association with another habitat type (eg. Podocarp-broadleaved forest). Although these species may occur together <del>or in isolation</del> throughout the Region, this habitat type is mostly found in the Middle Rangitikei Water Management Zone (Rang_2), with matagouri mostly found on sand country of the west coast of the Region, the East Coast Management Zone (East_1) and the Upper Whangaehu (Whau_</p>
Lowland forest supporting <i>Powelliphanta</i> snails	<p>Lowland forests <del>occurring</del> on deep moist soils of the Horowhenua Plains containing land snails (<i>Powelliphanta traversi</i> <i>traversi</i>). This forest is dominated by pukatea, kahikatea, and maire <del>tawaki</del> tawake in wet <u>sites</u> <del>areas</del>, and tawa, kohekohe, karaka, and totara in drier <del>areas</del> <u>sites</u>.</p> <p>This habitat type is described in Walker, 2003<sup>2</sup></p>	At Risk	<p>This habitat type supports <del>the a</del> threatened land snail which can be found under leaf litter.</p> <p>This species of land snail is known from the Lake Papaitonga (West_8) and Lake Horowhenua (Hoki_1a) Water Management Sub-zones, and may be present in even small and modified fragments of this habitat type.</p>
Mid-altitudinal forest supporting <i>Powelliphanta</i> snails	<p>Mid-altitudinal (460-610 m asl) forest dominated by rimu and miro with rewarewa and pigeonwood, OR low-growing scrub dominated by the tree fern wheki that contains the land snail (<i>Powelliphanta traversi tararuaensis</i>).</p> <p>This habitat type is described in Walker, 2003<sup>2</sup></p>	At Risk	<p>This habitat supports <del>the a</del> threatened land snail, which can be found under leaf litter and bush rice grass in areas where seepages are common and fertile alluvial soils or litter have accumulated.</p> <p>This species of land snail occurs in the Kahuterawa (Mana_11c) and Mangaore (Mana_13d) Water Management Subzones, and may be present in even small and modified fragments of this habitat type.</p>
Riparian Habitat Type			
Riparian margin	Any vegetation (whether indigenous or not, and including classified elsewhere in Schedule E) within 20 m of an area as identified in Schedule D as being a Site of Significance-Aquatic.	At Risk	Riparian margin vegetation can comprise indigenous vegetation, exotic vegetation or a combination of both and of any structures. This habitat type <del>will vary</del> <u>varies</u> greatly between patches in both <del>structure</del> <u>structure</u> and composition, and might be highly modified, contain artificial assemblages of species or include deliberately planted species (indigenous or exotic).

Habitat Type Name	Defined As	Classification	Further Description
<b>Tussockland Habitat Type</b>			
Tussockland below the Treeline	Red tussock-dominated tussocklands below the treeline in areas with frequent disturbance regimes that may be natural or human-induced, high water tables, and/or temperature inversions.	At Risk	<p>Red tussock <del>will be</del> is particularly dominant in humid climates on moist soils. Other tussock species that can be present include silver tussock and blue tussock. Silver tussock (although <del>no longer</del> not common) will be more important on higher fertility, frequently disturbed areas. Blue tussock may be uncommonly present as an inter-tussock species, <u>amongst red tussock</u>.</p> <p>Native and exotic woody species (eg. heather, monoao, Hebe, manuka and kanuka) are likely to be increasingly <u>present abundant</u> as natural successional processes advance.</p> <p>This habitat type can be found in Rang_1, Rang_2a, Rang_2b, Rang_2c, Rang_2d, Rang_2e, and Rang_2f, Water Management Sub-zones.</p>
<b>Wetland Habitat Type</b>			
Dune slack wetland	<p>Dune slack wetlands <del>are found</del> <u>occur in areas sites</u> where wind has eroded hollows or depressions, or a topographically low area where water is permanently or seasonally ponded.</p> <p>As per Johnson &amp; Gerbeaux, 2006<sup>4</sup> and Williams et al., 2006 &amp; Williams et al., 2007<sup>5</sup></p>	Rare <sup>6</sup>	Dune slack wetlands typically support <u>low-growing native herbfields</u> <sup>3</sup> .
Ephemeral wetland	<p>Ephemeral wetlands are usually of moderate fertility, and neutral pH, characterised by a marked seasonal high water table, ponding and drying. Change in water levels can be very dramatic to the point of complete drying and fluctuations between aquatic and terrestrial plant species can occur. Ephemeral wetlands are fed by ground water or an adjacent water body.</p> <p>As per Johnson &amp; Gerbeaux, 2006<sup>4</sup> and Williams et al., 2006 &amp; Williams et al., 2007<sup>5</sup></p>	Rare <sup>6</sup>	Ephemeral wetlands typically support turf habitat (generally < 3 cm tall). Turf habitats contain 62% of New Zealand's threatened or uncommon plants. Ephemeral wetlands can also <del>sometimes</del> support rushland <sup>3</sup> scrub.
Pakihi wetland	<p><del>Pakihi wetlands are often found in association with bogs and fens.</del></p> <p>Pakihi wetlands are rain-fed systems on mineral or sometimes peat substrate of very low fertility and low pH and can be seasonally dry.</p> <p>As per Johnson &amp; Gerbeaux, 2006<sup>4</sup> and Williams et al., 2006 &amp; Williams et al., 2007<sup>5</sup></p>	Rare <sup>6</sup>	<p>Pakihi can be found on level to rolling or sloping land in areas of high rainfall and old soils. Pakihi can support restiads, sedges, fernland, heathland and shrublands.</p> <p><u>Pakihi wetlands are often found in association with bogs and fens.</u></p>

Habitat Type Name	Defined As	Classification	Further Description
Seepage and Spring wetlands	<p><del>These wetlands are represented by that occur in association with areas of water that have percolated to the surface, with the volume of water present at seepages being less than that at springs. Substrates, nutrient levels and pH can vary from site to site.</del></p> <p>As per Johnson &amp; Gerbeaux, 2006 and Williams et al., 2006 &amp; Williams et al., 2007<sup>s</sup></p>	Rare <sup>s</sup>	Seepages and springs can be found at the point of change of slopes, and places where the water table is raised. These wetlands can support sedgeland, cushionfield, mossfield or scrub.
Swamp wetlands	<p><del>Swamp wetlands are of generally of high fertility, receiving nutrients and sediment from surface water and groundwater. Substrates are generally a combination of peat and mineral. Standing water and surface channels are often present, with the water table either permanently, or periodically, above much of the ground surface.</del></p> <p>As per Johnson &amp; Gerbeaux, 2006<sup>4</sup></p>	Threatened	Swamp wetland can be found on plains, valley floors and basins. Swamps can support sedges, rushes, reeds, flaxland, tall herbs, shrubs, scrub and forest <sup>s</sup> .
Bog and fen wetlands  <b><i>[Willie Shaw note: This definition should be above the definition of Pakihi wetland because of the reference made to it in that definition.]</i></b>	<p>These wetland classes are often found in association with each other.</p> <p>Bogs are formed on peat with rainwater the only source of water. Bogs are nutrient poor, poorly drained and aerated and usually acid. The water table is usually close to or just above the ground surface.</p> <p>Fens are wetlands of low to moderate acidity and fertility with a substrate of predominantly peat. Receives ground water and nutrients from adjacent mineral soils. The water table is usually close to or just below the surface.</p> <p>As per Johnson &amp; Gerbeaux, 2006<sup>s</sup></p>	Threatened	<p>Bogs can be found on relatively level or gently sloping ground including hill crests, basins, terraces and within other wetland classes. Bogs can support mosses, lichens, cushion plants, sedges, grasses, restiads, ferns, shrubs and trees.</p> <p>Fens can be found on slight slopes (eg. fans), toes of hillsides, on level ground where peat hasn't accumulated much and can grade into swamp. Fens support restiads, sedges, ferns, tall herbs, tussock grasses and scrub.</p>
Saltmarsh wetlands	<p><del>Saltmarsh wetlands occur in association with and associated mudflats occur within areas of tidal and saline influences (tidal and sub inter-tidal zones). Water sources come from ground water and adjacent saline or brackish waters.</del></p> <p>As per Johnson &amp; Gerbeaux, 2006<sup>s</sup></p>	Threatened	Saltmarsh can support herbfield, rushland and scrub <sup>s</sup> and occur in association with mudflats. In some places the mudflats can be extensive and are characteristic of estuarine wetland systems.
Lakes and Lagoons and their margins (including dune lakes)	<p><del>The Lakes in the Manawatu-Wanganui Region are associated with dune, river (including ox-bow lakes), and volcanic landforms.</del></p> <p>As per Johnson &amp; Gerbeaux, 2006<sup>s</sup></p>	Threatened	Lakes can exist entirely within a swamp, or have elements of wetland habitat on the lake margins. Lakes can also support have terrestrial habitat on the lake margins.

Habitat Type Name	Defined As	Classification	Further Description
<b>Naturally Rare Habitat Types</b>			
Cliffs, scarps and tors	<p>Where bare substrate, lichenfield, tussockland, herbfield, shrubland or scrub occurs on cliffs (including coastal cliffs), scarps or tors of any rock type.</p> <p>OR</p> <p>Where bare substrate or herbfield dominated by indigenous species occurs on flat land <del>at</del> <u>at</u> the top of coastal cliffs.</p> <p>As per Williams et al., 2006 &amp; Williams et al., 2007<sup>s</sup></p>	Rare	Vegetation types typically found in this habitat include lichen species, non-woody or low-growing semi-woody herbs, tussocks, shrubs and scrub. Species characteristic of these vegetation types include, for example, Pimelea, sea primrose, Selliera, Myosotis, shore puha, flax, toetoe, Astelia, Hebe, daisy species, kawakawa, mahoe, and broadleaf.
Karst systems	<p><del>Where</del> Bare substrate, shrubland, tussockland, flaxland, or herbfields, <del>occurring</del> <u>occurs</u> in sinkholes, cave entrances, caves and cracks in karst systems.</p> <p>As per Williams et al., 2006 &amp; Williams et al., 2007<sup>s</sup></p>	Rare	<p>Karst systems can be found on limestone, marble, dolomite or calcareous rock, and be subterranean or semi-subterranean.</p> <p>Karst systems are known in the Region from the Whanganui and Pohangina Valleys.</p>
Screes and Boulderfields	<p><del>Where</del> Bare substrate, lichenfield, shrubland, scrub or forest <del>occurring</del> <u>occurs</u> on screes or boulderfields of any rock type.</p> <p>As per Williams et al., 2006 &amp; Williams et al., 2007<sup>s</sup></p>	Rare	<p>Includes slopes covered in shingle, cobbles or rock (of any rock type) which may or may not support vegetation. Bare substrate is the dominant feature of this habitat type.</p> <p>Screes and boulderfields are often found associated with a larger cliff or slope. They provide habitat for lizards including the threatened small-scaled skink (<i>Oligosomia microlepis</i>), which is endemic to the Region.</p>
Active duneland	<p><del>Where</del> Grassland or sedgeland <del>occurring</del> <u>occurs</u> on active duneland formed on raw coastal sand.</p> <p>As per Williams et al., 2006 &amp; Williams et al., 2007</p>	Rare	Active duneland <del>are</del> <u>is</u> characterised by unstable sands. This continual instability of sand prevents the formation of soil and therefore the vegetation type that an active duneland can support is limited. Examples are Spinifex grassland and pingao sedgeland. Other indigenous species can also be present eg. Sand convolvulus and sand Carex.

Habitat Type Name	Defined As	Classification	Further Description
Stable duneland	<p>Where <del>g</del>Grassland, tussockland, herbfields (including Pimelea actea and P. arenaria), or shrubland occur<u>ings</u> on stable duneland formed on recent coastal sand.</p> <p>As per Williams et al., 2006 &amp; Williams et al., 2007</p>	Rare	<p>Vegetation types typically <del>found</del> <u>occurring</u> on stable duneland include: tussocks, low-growing or semi-woody herbs and shrubs. These vegetation types characteristically support, for example, toetoe, Selliera rotundifolia, sand Gunnera, native spinach, sand Coprosma, sand daphne, coastal tree daisy, pohuehue, tauhinu, Coprosma species and hangehange. Exotic invasive species are also a feature of stable duneland.</p> <p>The threatened species Pimelea actea is known from the Tura_1b, West_5, and Whau_4 Water Management Zones.</p>
Inland duneland	<p>Where <del>s</del>Scrub, tussockland, herbfield or forest occur<u>ings</u> on inland duneland formed on raw or recent sands inland.</p> <p>As per Williams et al., 2006 &amp; Williams et al., 2007</p>	Rare	<p>Vegetation types typically found on inland duneland include; tussock, low-growing or semi-woody herbs, shrubs, small trees and forest trees. These vegetation types characteristically support, for example, toetoe, flax, native spinach, manuka, kanuka, mahoe, lancewood, five-finger, hangehange, cabbage trees; titoki, akeake, ngaio, tawa, pigeonwood and mahoe.</p>