RECOMMENDED CHANGES TO SCHEDULE E

Reiterations of Schedule E and where to find them:

- Version One was presented in the Proposed One Plan.
- Version Two (first revision) was presented in Fleur Maseyk's Section 42A Report (Appendix 4)
- Version Three (second revision) was presented in Fleur Maseyk's Supplementary Evidence Report (Appendix 1).
- Version Four (third revision) is presented in this document, tabled during the One Plan Hearing (biodiversity chapter) 20 November 2008.

1. The four areas of change represented in Version Four of Schedule E are:
    a. correction to the references,
    b. an expansion of the glossary,
    c. a clarification of definition of the term 'heathland', and
    d. a collection of (mainly grammatical and structural) amendments as suggested by William Shaw in his Supplementary Evidence.

Correction to references

2. I refer throughout Version Three of Schedule E (as presented in my Supplementary Hearing Report) to Leathwick et al., 2005 (e.g. pg four, throughout Table E.1, and in footnote 1). This reference is intended to refer to the published poster, the visual representation of the dataset, and the correct reference should read 'Leathwick et al., 2004 wherever it occurs.

3. The full reference is:
   Leathwick, J., McGlone, M., Walker, S. and Briggs, C. 2004. *Predicted Potential Natural Vegetation of New Zealand* (poster). Landcare Research Ltd. Lincoln New Zealand.

An expansion of the glossary

4. Table E.1 refers to vegetation structure using peer reviewed terms (e.g. herbfield, tussockland, treeland etc.). These terms were initially defined with in the POP glossary, but were removed by recommendation of Helen Marr's Supplementary Report.

5. Schedule E defines these terms by way of reference to the published article in which they are defined (Atkinson, 1985). Upon reflection, it was considered that this did not provide adequate interpretation of the meaning of the vegetation structure terms. This realisation was made after my Supplementary Hearing Evidence was distributed.

6. Version Three (as presented in my Supplementary Hearing Report) of Schedule E included a short glossary of some of the terminology used throughout the Schedule, in particular in Table E.1. I recommend that this glossary be extended to include the definitions of the vegetation structure terms.

7. Where used in Table E.1 these terms have a footnote reference to both the glossary and Atkinson (1985), and I think it is appropriate for this reference to remain in association with Table E.1.

Clarification of definition of the term 'heathland'

8. 'Heathland' is also a term describing the vegetation structure of an community, although it is not a term defined by Atkinson (1985). In relation to wetland habitat, it is a useful term providing meaningful description of a particular type of wetland habitat (pakihi wetland type).

9. The term 'Heathland' has been added to the glossary in Schedule E and defined according to Johnson & Gerbeaux (2006). Where used in Table E.1 the term has a footnote reference to both the glossary and Johnson & Gerbeaux (2006).

Grammatical edits and rearranging of Table E.1

10. William Shaw's (technical expert for Meridian Energy) Supplementary Evidence includes a number of suggested edits to text in Table E.1. These are mostly grammatical or structural changes with an aim to provide further clarification and accuracy. I consider them, in the most part, to be useful suggestions and where this is the case have amended Table E.1 accordingly.

11. The changes to Schedule E discussed above are summarised in Table 1.

Table 1: Summary of changes made to Schedule E since Version Three.

Change	Version Three (Supplementary Hearing Report, Appendix 1)	Version Four (attached)
Correction of reference	Leathwick et al, 2004 Full reference (footnote 1 below Table E.1): Leathwick, J., McGlone, M., Walker, S. and Briggs, C. 2005. *New Zealand's Potential Vegetation Pattern.* Landcare Research Ltd. Lincoln New Zealand. Manaaki Whenua Press.	Leathwick et al, 2005 Full reference (footnote 1 below Table E.1): Leathwick, J., McGlone, M., Walker, S. and Briggs, C. 2004. *Predicted Potential Natural Vegetation of New Zealand* (poster). Landcare Research Ltd. Lincoln New Zealand.
Definition of vegetation structure terms added to Schedule E glossary	*Not defined*	The following terms are now defined within the glossary included in Schedule E: boulderfield, cushionfield, fernland, flaxland, forest, grassland, herbfield, lichenfield, mossfield, rushland, scrub, sedgeland, shrubland, treeland, and tussockland.
Editing of footnotes to Table E.1 (footnote relates to the vegetation structure terms listed in the row above)	[3] Vegetation structure is defined as per Atkinson, I.A.E. 1985. Derivation of vegetation mapping units for an ecological survey of Tongariro National Park, North Island, New Zealand. *New Zealand Journal of Botany 23:361-378*.	[3] Vegetation structure is defined as per Atkinson, I.A.E. 1985. Derivation of vegetation mapping units for an ecological survey of Tongariro National Park, North Island, New Zealand. *New Zealand Journal of Botany 23:361-378* and detailed in the glossary
Addition of footnote to Table E.1 (footnote relates to the word 'heathland')	*No footnote*	[7] Definition follows Johnson, P. & Gerbeaux, P. 2004. *Wetland Types in New Zealand.* Department of Conservation, Wellington and is defined in the glossary
Grammatical and structural changes	-	Changes are identified within Version Four of Schedule E via 'track changes'. (blue text, additions are indicated by underlined text, deletions are indicated by ~~strike through~~ text) NB: editing of criteria in Table E.2 resulted in a change in some of the criteria numbering.

References:

Atkinson, I.A.E. 1985. Derivation of vegetation mapping units for an ecological survey of Tongariro National Park, North Island, New Zealand. *New Zealand Journal of Botany 23:361-378*

Johnson, P. & Gerbeaux, P. 2004. *Wetland Types in New Zealand.* Department of Conservation, Wellington.

SCHEDULE E: INDIGENOUS BIOLOGICAL DIVERSITY

Rare, Threatened and At Risk habitat types are areas of indigenous vegetation and/or physical substrate of a type identified in Table E1 as being "Rare", "Threatened" or "At Risk" respectively, and which meet the criteria described in Table E2 for determining whether an area of indigenous vegetation and/or physical substrate constitutes a "habitat" for the purposes of this Plan.

Indigenous vegetation refers to an assemblage of species that co-exist together and which provide resources for other species. Indigenous ~~habitat~~ vegetation is ~~habitat~~ vegetation comprised primarily of indigenous species, but which can include exotic species.

It is recommended that a suitably qualified expert is engaged for assistance with implementing Schedule E. This could be:

a) a consultant ecologist
b) Horizons staff (who will provide this service, including advice and a site visit where required in the first instance. It may be that following this initial provision of information, the proposal will require an Assessment of Ecological Effects to be provided as a component of the consent application. In such instances it is recommended that a consultant ecologist be engaged to conduct the assessment).

Horizons can in all cases, provide any spatial data and existing site information where available as relevant to the site and the proposed activity. References referred to in this schedule are available on the internet or from Horizons on request.

Interpreting Schedule E:

Q.1 Do I need a resource consent?

YES IF:

A. The area of vegetation and/or physical substrate is determined to be habitat type classified as 'Rare', 'Threatened' or 'At Risk' as described in Table E.1 **AND** meets any criteria in section (a) of Table E.2.

NO IF:

A. The area of vegetation and/or physical substrate is determined to be habitat type that is not classified in Table E.1
OR

B. The area of vegetation and/or physical substrate is determined to be habitat type classified as 'Rare', 'Threatened' or 'At Risk' in Table E.1 but **does not** meet any criteria in section (a) of Table E.2, or **does** meet any criteria in section (b) of Table E.2.

Q.2 What rule stream classification will my proposal be assessed under?

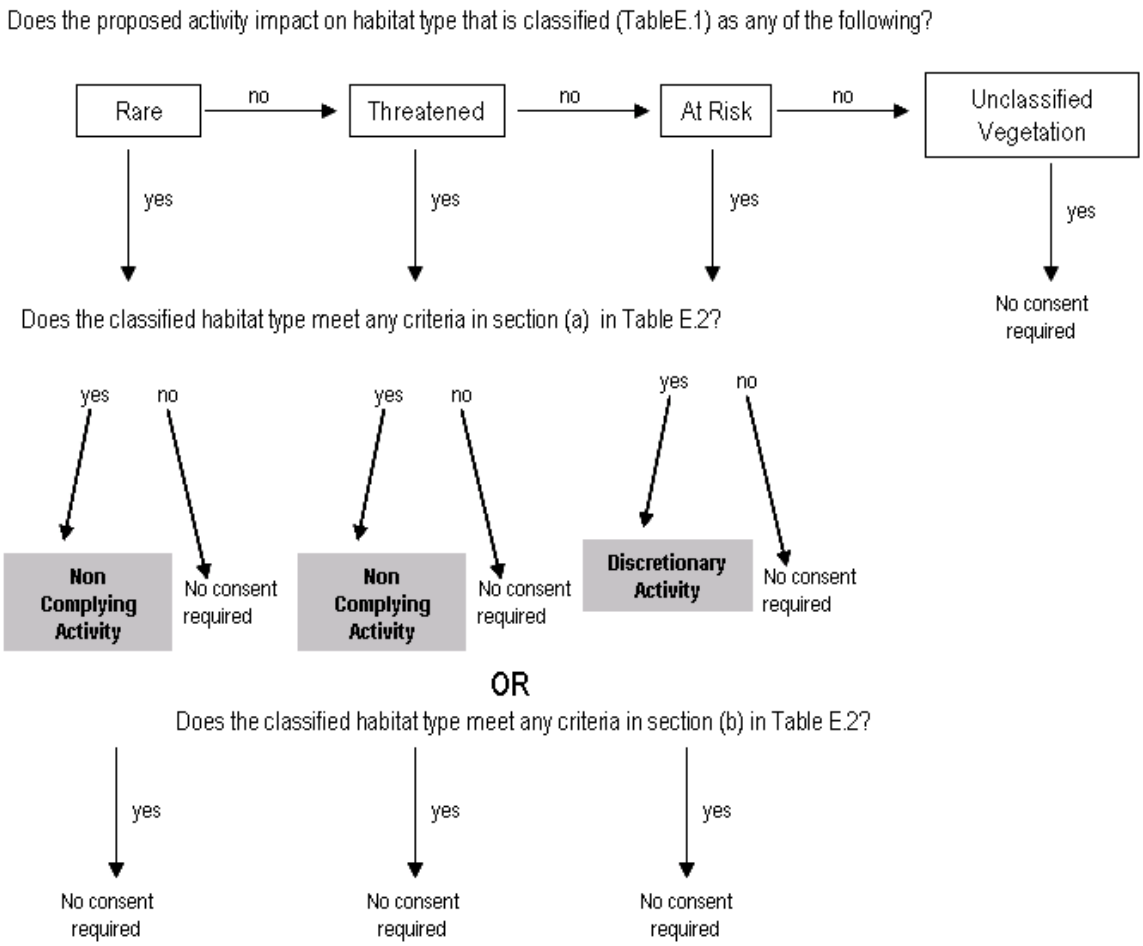

Table E.1:

NOTE:. This table describes characteristics of habitat types as they are expressed at the regional scale. Patches of any given habitat type may not exhibit all elements considered characteristic of that habitat type. The descriptions are not exhaustive. Some species listed may not be present, or be present in different abundances than indicated. Other species not listed here can also be present. Sites of the same habitat type can exhibit differences to each other. Further, there will likely be differences in predicted composition and actual composition on the ground, particularly as a result of site modification and pest impacts.

The first twelve habitat type names listed in Table E.1 have been taken from Leathwick et al., 2004[1], although some names have been modified for clarity and applicability to the Manawatu-Wanganui Region.

Water Management Zones and Sub-zones are described in Schedule D and mapped in Figure E.1. Words followed by an asterisk (*) are defined in the glossary at the end of the Schedule.

Habitat Type Name	Defined As	Classification	Further Description
Forest Habitat Type			
Hardwood/broadleaved forest	Tawa forest in association with other broadleaved species. Hardwood/broadleaved forest is described as Kauri/taraire-kohekohe-tawa forest in Leathwick et al. 2004[1] NB: kauri, taraire and kohekohe do not occur naturally in the region.	Threatened	Kamahi, hinau and black maire are likely to be common*. Podocarp species such as kahikatea, rimu or totara may be emergent. Titoki, rewarewa or northern rata may also be a feature. The subcanopy is likely to comprise common broadleaved species. This habitat type is found in hillcountry north of Wanganui and the east coast at elevations of 0 - 150 m asl.
Kahikatea-pukatea-tawa forest	Kahikatea dominated forest on lowland alluvium and floodplains commonly found in association with pukatea and tawa. Kahikatea-pukatea-tawa forest is described in Leathwick et al. 2004[1]	Threatened	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. 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.
Podocarp forest	Podocarp forest dominated by matai, kahikatea or totara. Podocarp forest is described as Matai-kahikatea-totara forest in Leathwick et al., 2004[1]	Threatened	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. Podocarp forest is mostly confined to the Wanganui, Rangitikei and Ruapehu Districts from sea level to 900 m asl.

Habitat Type Name	Defined As	Classification	Further Description
Podocarp/broadleaf-fuchsia forest	Dominated by podocarp species (matai, totara, kahikatea or rimu, at varying levels of abundance ~~to varying degrees~~) over a subcanopy of broadleaf and fuchsia. Podocarp/broadleaf-fuchsia forest is described as Matai-totara-kahikatea-rimu/broadleaf-fuchsia forest in Leathwick et al., 2004[1]	Threatened	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. 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.
Podocarp/tawa-mahoe forest	Tawa and mahoe dominated forest~~.~~, with scattered emergent podocarp species. Podocarp/tawa-mahoe forest is described as Kahikatea-matai/tawa-mahoe forest in Leathwick et al., 2004[1]	Threatened	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. This habitat type is found on dry dune land and low hillcountry (from sea level to 750 m asl)
Rimu/tawa-kamahi forest	Tawa and kamahi dominated forest~~.~~, with scattered emergent rimu. Rimu/tawa-kamahi forest is described in Leathwick et al., 2004[1].	Threatened	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 (e.g. inland from Wanganui). Common broadleaved species are also likely to be present in the understorey. Rimu/tawa-kamahi forest can be found in all Districts of the Region from sea level to 800 m asl.

Habitat Type Name	Defined As	Classification	Further Description
Podocarp/kamahi forest	Podocarp forest dominated by rimu, miro, kahikatea, matai or totara in varying dominance over abundant kamahi. Podocarp/kamahi forest is described as Rimu-matai-miro-totara/kamahi forest and Rimu-miro-totara/kamahi forest in Leathwick et al., 2004[1]	At Risk	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. Podocarp/kamahi forest can be found throughout the region, excluding the western lowland area, predominately at elevations between 150 – 900 m asl. However, Podocarp/kamahi forest can be found between 50 – 1100 m asl.
Hall's totara/broadleaf forest	Hall's totara and broadleaf dominant forest ~~found~~ in montane sites lacking beech. Hall's totara/broadleaf forest is described in Leathwick et al., 2004[1]	At Risk	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. 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.
Podocarp/red beech-kamahi-tawa forest	Red beech, kamahi and tawa dominated forest found ~~at~~ in mid-altitude~~e~~inal zones (400 – 700 m asl). Podocarp/red-beech-kamahi-tawa forest is described as Rimu-miro/tawari-red beech-kamahi-tawa forest in Leathwick et al., 2004[1]	Threatened	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. Podocarp/red beech-kamahi-tawa forest is largely confined to the Rang_2b Water Management Sub-zone and can be found from 400 – 700 m asl.
Podocarp/black beech/mountain beech forest	Black beech and mountain beech dominated forest found at mid-altitudinal zones (400 – 1250 m asl). Podocarp/black beech/mountain beech forest is described as Matai-totara/black beech/mountain beech forest in Leathwick et al., 2004[1]	Threatened	Emergent podocarp species (e.g. 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. 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.

Habitat Type Name	Defined As	Classification	Further Description
Hall's totara/silver beech-kamahi forest	Silver beech dominant forest commonly in association with abundant ~~a high abundance of~~ kamahi. Hall's totara/silver beech-kamahi forest is described as Hall's totara/silver beech-kamahi-southern rata in Leathwick et al. 2004[1]	Threatened	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 ~~presence will be~~ strongly influenced by the ~~presence~~ effects (current and/or historic) of possum. This habitat type is found at high elevations (750 – 1400 m asl) in the montane areas of the Rangitikei and Manawatu Districts.
Mountain beech forest	Mountain beech forest ~~is dominated by mountain beech,~~ often occuring without many other tree species. Mountain beech forest is described in Leathwick et al, 2004[1]	At Risk	Upland ~~Mountain~~ conifers (e.g. Hall's totara, pahautea, and mountain toatoa) and other species (e.g. 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. Mountain beech forest can be dominant at higher altitudes (650 – 1450 m asl), especially on eastern sites and in areas ~~of~~ with harsh (stress-prone) environmental conditions.
Kowhai-broadleaved forest	Forest dominated by kowhai growing on river terraces, river risers or cliffs and bluffs associated with rivers.	Threatened	Kowhai-broadleaf forest is typically low-growing forest often with a mixture of small tree species and shrubs including lacebark, ribbonwood, kanuka and divaricating shrubs. The absence of a dense canopy of tawa or kamahi from these forest is notable. 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.
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 terrace, floodplains, shingle fans or sand dunes supporting divaricating plant species	Forest or scrub ~~growing~~ 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 (*Olearia gardnerii*), heart-leaved kohuhu (*Pittosporum obcordatum*), *Coprosma obconica, Coprosma wallii*, *Melicytus flexuosus*, fierce lancewood (*Pseudopanax ferox*), OR Forest or scrub ~~growing~~ on freely draining shingle fans, river terraces and sand dunes that provides habitat ~~to~~ for matagouri (*Discaria toumatou*).	At Risk	This habitat type supports threatened or regionally uncommon divaricating plant species. This habitat type may be disturbed (naturally or human induced), contain exotic species, or other divaricating species than those listed here, or be found in association with another habitat type (e.g. Podocarp-broadleaf forest). Although these species may occur together or in isolation 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_1).
Lowland forest supporting *Powelliphanta* land snails	Lowland forests ~~occurring~~ on deep moist soils of the Horowhenua Plains containing land snails (*Powelliphanta traversi traversi*). This forest is dominated by pukatea, kahikatea, and maire tawake ~~tawaki~~ in wet areas, and tawa, kohekohe, karaka, and totara in drier areas. This habitat type is described in Walker, 2003[2]	At Risk	This habitat type supports the threatened land snail *(Powelliphanta traversi traversi)* which can be found under leaf litter. 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.
Mid-altitudinal forest supporting *Powelliphanta* land snails	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 land snails (*Powelliphanta traversi tararuaensis*). This habitat type is described in Walker, 2003[2]	At Risk	*This habitat supports the threatened land snail (Powelliphanta traversi tararuaensis),* 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. This species of land snail occurs in the Kahuterawa (Mana_11c) and Mangaore (Mana_13d) Water Management Sub-zones, and may be present in even small and modified fragments of this habitat type.
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 strucutre[3]. This habitat type ~~will vary~~ varies greatly between patches in both structure 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
Tussockland Habitat Type			
Tussockland below the treeline	Red tussock dominated tussockland[3] 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	Red tussock ~~will be~~ 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 ~~no longer~~ common) will be more important on higher fertility, frequently disturbed areas. Blue tussock may be uncommonly present as an inter-tussock species amongst red tussock. Native and exotic woody species (e.g. heather, monoao, Hebe, manuka and kanuka) are likely to be increasingly ~~present~~ abundant as natural successional processes advance. 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.
Wetland Habitat Type			
Dune slack wetland	Dune slack wetlands ~~are found~~ occur in areas where wind has eroded hollows or depressions, or a topographically low area where water is permanently or seasonally ponded. As per Johnson & Gerbeaux, 2006[4] and Williams et al., 2006 & Williams et al., 2007[5]	Rare[6]	Dune slack wetlands typically support low-growing herbfields[3].
Ephemeral wetland	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 feed by ground water or a adjacent water body. As per Johnson & Gerbeaux, 2006[4] and Williams et al., 2006 & Williams et al., 2007[5]	Rare[6]	Ephemeral wetlands typically support turf habitat (generally < 3 cm tall). Turf habitat contains 62% of New Zealand's threatened or uncommon plants. Ephemeral wetlands can also ~~sometimes~~ support rushland[3] scrub.

Habitat Type Name	Defined As	Classification	Further Description
Bog and fen wetlands	These wetland classes are often found in association with each other. 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. 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. As per Johnson & Gerbeaux, 2006[4]	Threatened	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. Fens can be found on slight slopes (e.g. 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.
Pakihi wetland	~~Pakihi wetlands are often found in association with bogs and fens.~~ Pakihi wetlands are rain-fed systems on mineral or sometimes peat substrate of very low fertility and low pH and can be seasonally dry. As per Johnson & Gerbeaux, 2006[4] and Williams et al., 2006 & Williams et al., 2007[5]	Rare[6]	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, shrubland[3] and heathland[7]. Pakihi wetlands are often found in association with bogs and fens.
Seepage and Spring wetlands	~~These~~ ~~w~~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. As per Johnson & Gerbeaux, 2006[4] and Williams et al., 2006 & Williams et al., 2007[5]	Rare[6]	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.[3]

Habitat Type Name	Defined As	Classification	Further Description
Swamp wetlands	~~Swamp w~~ 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. As per Johnson & Gerbeaux, 2006[4]	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[3].
~~Bog and fen wetlands~~	~~These wetland classes are often found in association with each other.~~ ~~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.~~ ~~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.~~ ~~As per Johnson & Gerbeaux, 2006[4]~~	~~Threatened~~	~~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.~~ ~~Fens can be found on slight slopes (e.g. 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.~~
Saltmarsh wetlands	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. As per Johnson & Gerbeaux, 2006[4]	Threatened	Saltmarsh can support herbfield, rushland and scrub[3] 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)	~~The~~ ~~l~~Lakes in the Manawatu-Wanganui Region are associated with dune, river (including ox-bow lakes) and volcanic ~~activities~~ landforms. As per Johnson & Gerbeaux, 2006[5]	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.
Naturally Rare Habitat Type			

Habitat Type Name	Defined As	Classification	Further Description
Cliffs, scarps and tors	Where bare substrate, lichenfield, tussockland, herbfield, shrubland or scrub[3] occurs on cliffs (including coastal cliffs), scarps or tors of any rock type. OR Where bare substrate or herbfield[3] dominated by indigenous species occurs on flat land ~~on~~ at the top of coastal cliffs. As per Williams et al., 2006 & Williams et al., 2007[5]	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	~~Where~~ B~~b~~are substrate, shrubland, tussockland, flaxland, or herbfield[3], ~~occurs~~ occurring in sinkholes, cave entrances, caves and cracks in karst systems. As per Williams et al., 2006 & Williams et al., 2007[5]	Rare	Karst systems can be found on limestone, marble, dolomite or calcareous rock, and be subterranean or semi-subterranean. Karst systems are know in the Region from the Whanganui and Pohangina Valleys.
Screes and boulderfields	~~Where~~ ~~b~~Bare substrate, lichenfield, shrubland, scrub or forest[3] ~~occurs~~ occurring on screes or boulderfields of any rock type. As per Williams et al., 2006 & Williams et al., 2007[5]	Rare	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. Screes and boulderfields are often found associated with a larger cliff or slope. They provide habitat for lizards including the threatened small scaled skink (*Oligosomia microlepis*) which is endemic to the Region.
Active duneland	~~Where~~ G~~g~~rassland or sedgeland[3] ~~occurs~~ occurring on active duneland formed on raw coastal sand. As per Williams et al., 2006 & Williams et al., 2007[5]	Rare	Active duneland ~~are~~ is 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 e.g. sand convolvulus and sand Carex.

Habitat Type Name	Defined As	Classification	Further Description
Stable duneland	~~Where~~ Ggrassland, tussockland, herbfield[3] (including *Pimelea actea* and *P. arenaria*), or shrubland[3] ~~occurs~~ occurring on stable duneland formed on recent coastal sand. As per Williams et al., 2006 & Williams et al., 2007[5]	Rare	Vegetation types typically ~~found~~ occuring 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. The threatened species *Pimelea actea* is known from the Tura_1b, West_5, and Whau_4 Water Management Zones.
Inland duneland	~~Where~~ Sscrub, tussockland, herbfield or forest[3] ~~occurs~~ occurring on inland duneland formed on raw or recent sands inland. As per Williams et al., 2006 & Williams et al., 2007[5]	Rare	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.

[1] Leathwick, J., McGlone, M., Walker, S. and Briggs, C. 2004. *Predicted Potential Natural Vegetation of New Zealand* (poster). Landcare Research Ltd. Lincoln New Zealand.

[2]Walker, K.J. 2003. Recovery plans for *Powelliphanta* land snails 2003 – 2013. *Threatened Species Recovery Plan 49*. Department of Conservation, Wellington.

[3] Vegetation structure is defined as per Atkinson, I.A.E. 1985. Derivation of vegetation mapping units for an ecological survey of Tongariro National Park, North Island, New Zealand. *New Zealand Journal of Botany 23:361-378* and detailed in the glossary.

[4] Johnson, P. & Gerbeaux, P. 2004. *Wetland Types in New Zealand.* Department of Conservation, Wellington.

[5] Williams. P.A., Wiser, S., Clarkson, B., Stanley, M. 2006. A physical and physiognomic framework for defining and naming originally rare terrestrial ecosystems: first approximation. *Landcare Research Internal Report: LCO506/185*. Landcare Research New Zealand Ltd.

Williams. P.A., Wiser, S., Clarkson, B., 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.*

[6] Wetland habitat found on active, stable or inland duneland have been identified as Rare habitat type according to Williams *et al*., 2006.

[7] Definition follows Johnson, P. & Gerbeaux, P. 2004. *Wetland Types in New Zealand.* Department of Conservation, Wellington and is defined in the glossary.

Table E.2:

(a) An area of any habitat type described in Table E.1, is also required to meet any of the following criteria to be considered habitat for the purposes of this plan:
Forest Habitat Type Classified as Threatened or At Risk i. Areas of continuous indigenous vegetation covering at least 0.25 ha within any Water Management Sub-zone coded red (Figure E.1). Or ii. Areas of continuous indigenous vegetation covering at least 1 ha within any Water Management Sub-zone coded orange or yellow (Figure E.1). Or ~~iii. Areas of habitat type classified as Threatened were it occurs as treeland over at least 1 ha. Or~~ ~~iv. Areas of treeland over at least 1 ha within any Water Management Sub-zone coded red (Figure E.1) Or~~ ~~v. Areas of treeland over at least 2 ha within any Water Management Sub-zone coded orange or yellow (Figure E.1) Or~~ iii. Areas of continuous indigenous vegetation covering at least 0.5 ha, where one or more other areas of indigenous habitat (covering at least 0.5 ha), is present up to 500 m away. Or iv. Areas of continuous indigenous vegetation covering at least 0.5 ha that support indigenous understorey vegetation. Or v. Discontinuous indigenous vegetation covering at least 1 ha present within 50 m of an area of continuous indigenous vegetation covering at least 0.5 ha. Or vi. Areas of indigenous vegetation covering at least 0.5 ha in gully systems. Or vii. Areas of continuous indigenous vegetation within 5 m of a river bed and covering at least 0.1 ha and extending at least 100 m along the length of the river. Or viii. Areas containing *Olearia gardnerii, Pittosporum obcordatum, Coprosma obconica, Coprosma wallii, Melicytus flexuosus, Pseudopanax ferox* or *Discaria toumatou* covering at least 0.1 ha. Or ix. An area of indigenous vegetation of any size containing *Powelliphanta* land snails. Or x. Areas of indigenous vegetation that have been established for the purpose of habitat manipulation including habitat creation, restoration and buffering, where such an area covers at least 1 ha as a discrete site or at least 0.5 ha where it is adjacent to an existing area of indigenous habitat. Or Treeland Habitat Type Classified as Threatened or At Risk xi. Areas of habitat type classified as Threatened were it occurs as treeland over at least 1 ha. Or xii. Areas of treeland over at least 1 ha within any Water Management Sub-zone coded red (Figure E.1) Or xiii. Areas of treeland over at least 2 ha within any Water Management Sub-zone coded orange or yellow (Figure E.1) Or Riparian Habitat Type Classified as At Risk xiv. An area of vegetation of any size or species composition (including exotic vegetation) within 20 m of an area identified in Schedule D as being a Site of Significance – Aquatic. Or Grassland Habitat Type Classified as At Risk xv. An area of grassland covering at least 0.5 ha. Or Wetland Habitat Type Classified as Threatened xvi. Open water associated with wetland habitat, excluding stock ponds less than 0.5 ha in area. Or xvii. Areas of naturally occuring indigenous wetland habitat either in association with open water (fresh or estuarine), or excluding open water, covering at least 0.1 ha. Or xviii. Areas of indigenous vegetation that have been established in the course of wetland habitat restoration. Or xix. Areas of artificially created wetland habitat covering at least 0.5 ha excepting areas that met criteria (b)vi, (b)vii, (b)viii or (b)ix. Or Naturally Rare Habitat Type and Wetland Habitat Type Classified as 'Rare' xx. Areas of indigenous vegetation and/or naturally occuring bare substrate that form part of a rare Habitat Type covering at least 0.05 ha. Or xxi. Areas of indigenous habitat created at some time in the course of dune habitat restoration (including dune stabilisation)

(b) An area of any habitat type described in Table E.1, is also required to meet any of the following criteria to not be considered habitat for the purposes of this plan:

Forest Habitat Type Classified as Threatened or At Risk

i. Areas of treeland excluding sites that meet any of the criteria (a)~~iii~~ xi (a)~~iv~~ xii, or (a)~~v~~ xiii of Table E.2. Or
ii. Woodlots of indigenous tree species planted for the purposes of timber harvest. Or
iii. Indigenous vegetation planted for landscaping, horticultural (including shelter belts) or private gardening purposes.

Wetland Habitat Type Classified as Threatened

iv. Damp gully heads, or paddocks subject to regular ponding, dominated by pasture or exotic species in association with wetland sedge and rush species. Or
v. Ditches or drains supporting raupo, flax or other wetland species (e.g. *Carex* sp., *Isolepis* sp.), or areas of these species in drains or slumps associated with road reserves or rail corridors. Or
vi. Areas of open water-created for the purposes of stock watering, or water storage for the purposes of irrigation, including old gravel pits (but excluding lakes and areas of open water associated with indigenous wetland habitat, or wetland habitat that meets Criterion (a) xix). Or
vii. A pond and/or barrier ditch system specifically designed and installed for the treatment of animal effluent Or
viii. Habitat created and maintained for the purposes of waste water treatment. Or
ix. Habitat created and maintained for the purposes of sediment control. Or
x. Habitat created and maintained in association or as part of any hydroelectric power generation scheme, or in relation to the implementation of any resource consent conditions or agreements relating to the operation of any hydroelectric power scheme. Or
xi. Open water and associated vegetation created for landscaping purposes or amenity values where the planted vegetation is predominately exotic or includes assemblages of species not naturally found in association with each other, on the particular landform or at the geographical location of the created site.

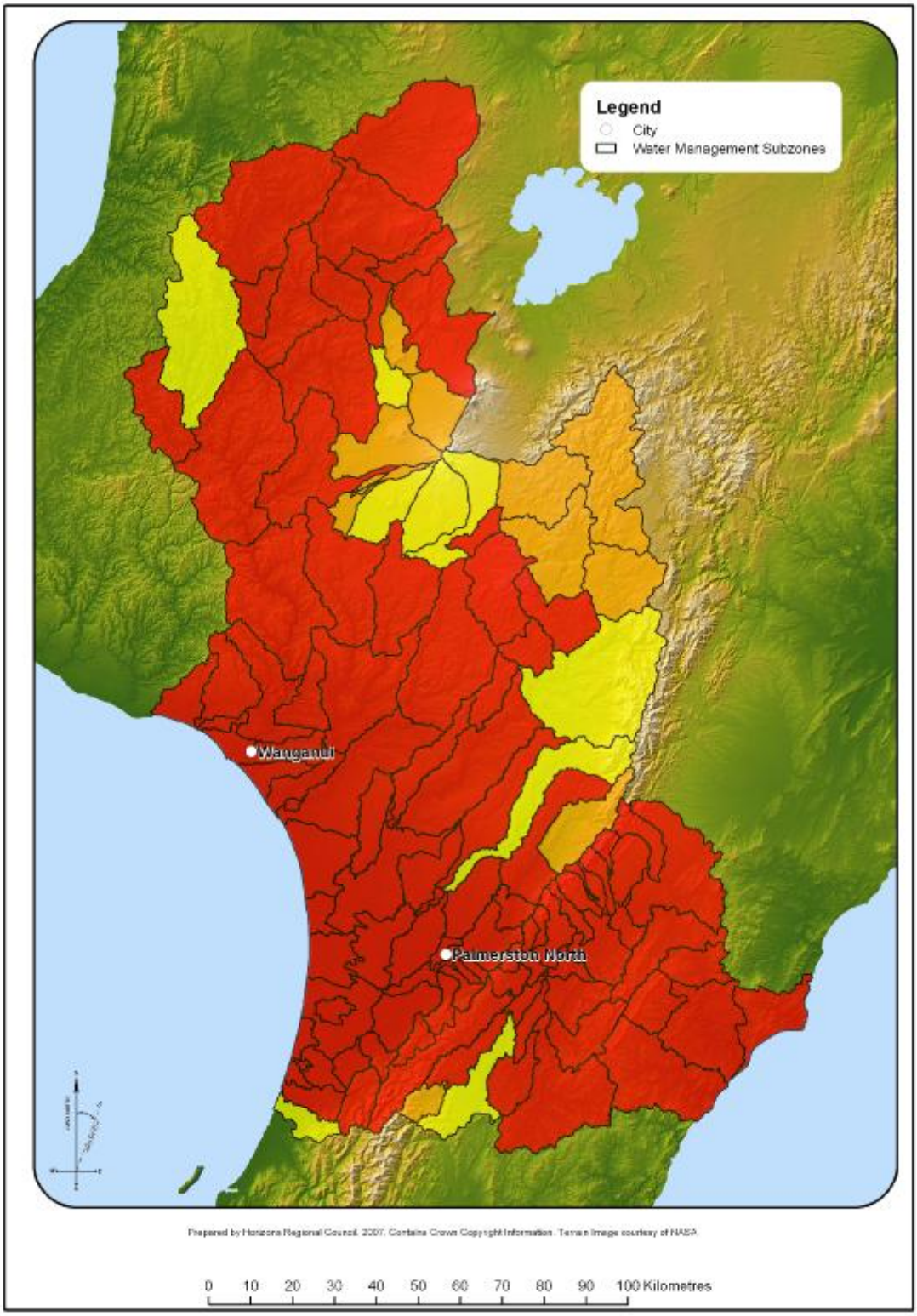

Figure E.1: Map of the Manawatu-Wanganui Region with Water Management Sub-zones coloured according to habitat type classification. Red coloured WMS indicate that where habitat exists within that WMS it is predominately Threatened habitat type. Orange coloured WMS indicate that where habitat exists within that WMS it is predominately Threatened or At Risk habitat type. Yellow coloured WMS indicate that where habitat exists within that WMS it is predominately vegetation not classified by this Schedule. This map is to be read in conjunction with criteria in Table E.2.

Glossary

Abundant[1] Species are considered to be abundant when they contribute more than most other species to the composition of an area of interest, but are not the dominant species.

Association A species, or group of species, landform or soil type occuring in space together. Such associations can be observed in geographical pattern across the landscape, or in distinctive community groupings.

Boulderfield[3] Land in which the area of unconsolidated bare boulders (> 200 mm diam.) exceeds the area covered by any one class of plant growth form. Boulderfields are named from the leading plant species when plant cover is ≥ 1%.

Broadleaved species A generic term referring to a wide range of flowering species excluding the beech and conifer species, which can also be applied to dominant hardwood species (e.g. tawa). Common examples of species referred to as broadleaved species include (but are not restricted to) kamahi, titoki, fuchsia, maire, hinau, tawa, mahoe, and *Coprosma* species. The term 'broadleaf' is specific and refers to *Griselina littoralis* or *Griselina lucida*.

Common[1] Species are considered to be common when they contribute more than other species, but less than still other species to the composition of an area of interest. Species that are common contribute less to the composition of an area of interest than species which are abundant or dominant.

Cushionfield[3] Vegetation in which the cover of cushion plants in the canopy is 20-100% and in which the cushion-plant cover exceeds that of any other growth form or bare ground. Cushion plants include herbaceous, semi-woody and woody plants with short densely packed branches and closely spaced leaves that together form dense hemispherical cushions. The growth form occurs in all species of *Donatia, Gaimardia, Hectorella, Oreobolus*, and *Phyllachne* as well as in some species of *Achiphylla, Celmisia, Centrolepis, Chionohebe, Colobanthus, Dracophyllum, Kelleria, Haastia, Leucogenes, Luzula, Myosotis, Poa, Raoulia,* and *Scleranthus*.

Dominated / dominant[1] Species are considered to be dominant (or to dominate) when they contribute more than any other species to the composition of an area of interest. Dominant species can be considered the most characteristic species of the area of interest (e.g. habitat type).

Duneland Refers to areas where the landform is characterised by sand dunes (active or stable). Duneland is found in the sand country.

Fernland[3] Vegetation in which the cover of ferns in the canopy is 20-100% and in which the fern cover exceeds the cover of any other growth form or bare ground. Tree ferns ≥ 10 cm diameter at breast height (dbh) are excluded as trees.

Flaxland[3] A subclass of tussockland where species of *Phormium* are dominant.

Forest[3] Woody vegetation in which the canopy cover of trees and shrubs is more than 80% and in which tree cover exceeds shrub cover. Trees are woody plants with a diameter at breast height (dbh) of more than 10 centimetres. Tree ferns with a dbh of more than 10 cm are treated as trees.

Grassland[3] Vegetation in which the cover of grass in the canopy is 20-100% and in which grass cover exceeds the cover of any other growth form or bare ground. Tussock grasses are excluded from the grass growth form.

Heathland[4] A combination of several vegetation structural classes. Heath plants are trees, shrubs or dwarf shrubs, typically slow-growing and often stunted, with small, hard, scale-like or needle-like leaves with a thick waxy cuticle. The foliage tends to be flammable, resistant to decay and produces acid litter. Heathland which occurs on wet substrates (e.g. pakihi) usually comprise a mixture of shrubland or treeland with rush-like species, wire rush and ferns.

Herbfield[3] Vegetation in which the cover of herbs in the canopy is 20-100% and in which the herb cover exceeds the cover of any other growth form or bare ground. Herbs include all herbaceous species.

Lichenfield[3] Vegetation in which the cover of lichens in the canopy is 20-100% and in which the lichen cover exceeds the cover of any other growth form or bare ground.

Lowland[2] Typically, lowland refers to the elevation between sea level and approximately 300 m asl. However, characteristics of lowland forest (e.g. species presence,

	species composition, diversity) can exhibit itself at higher altitudes (e.g. Whanganui National Park comprises lowland forest at elevations greater than 300 m asl).
Hillcountry	Refers to land where the landform is characterised by rolling to steep hills.
Mid-altitudinal[2]	Refers in general to the areas of land between elevations supporting characteristically lowland vegetation and elevations supporting characteristically montane vegetation. Typically, mid-altitudinal elevations will be in the order of between 400 – 950 m asl, although some variance can be expected.
Mossfield[3]	Vegetation in which the cover of mosses in the canopy is 20-100% and in which the moss cover exceeds the cover of any other growth form or bare ground.
Occasional[1]	Species are considered to be occasional when they contribute more than scattered species, but less than most species to the composition of an area of interest. Species that are occasional contribute considerably less to the composition to an area of interest than species which are common, abundant or dominant and can be expected to be encountered infrequently within the area of interest.
Podocarp	Southern hemisphere conifer which has cones modified into fleshy berry-like structures but do not have flowers. Podocarp species include the totara species, matai, miro, kahikatea and rimu.
Rushland[3]	Vegetation in which the cover of rushes in the canopy is 20-100% and in which the rush cover exceeds the cover of any other growth form or bare ground. Included in the rush growth form are some species of *Juncus*, *Apodasmia*, and all species of *Sporadanthus* and *Empodisma*. Tussock rushes are excluded.
Sand country	Land where the dominate substrate is sand (improved or unimproved). In the Manawatu-Wanganui Region, the sand country is defined by the boundaries of the Foxton Ecological District.
Scattered[1]	Species are considered to be scattered when they contribute less than most other species to the composition of an area of interest. Species that are scattered contribute considerably less to the composition to an area of interest than species which are occasional, common, abundant or dominant and can be expected to be encountered infrequently, and with a sparse distribution within the area of interest.
Scrub[3]	Woody vegetation in which the cover of shrubs and trees in the canopy is > 80% and in which shrub cover exceeds that of trees. Shrubs are woody plants <10 cm diameter at breast height (dbh).
Sedgeland[3]	Vegetation in which the cover of sedges in the canopy is 20-100% and in which the sedge cover exceeds that of any other growth form or bare ground. Included in the sedge growth form are many species of *Carex*, *Uncinia* and *Bolboschoenus*. Tussock-sedges and reed forming sedges are excluded.
Shrubland[3]	Woody vegetation in which the cover of shrubs in the canopy is 20-80% and in which the shrub cover exceeds the cover of any other growth form or bare ground.
Treeland[3]	Vegetation in which the cover of trees in the canopy is 20-80%, with tree cover exceeding the cover of any other growth form, and in which the trees form a discontinuous upper canopy above either a lower canopy of predominantly non-woody vegetation or bare ground. (Note: vegetation consisting of trees above shrubs is classified as either forest or scrub depending on the proportion of trees and shrubs in the canopy).
Tussockland[3]	Vegetation in which the cover of tussocks in the canopy is 20-100% and in which the tussock cover exceeds the cover of any other growth form or bare ground. Tussocks include all grasses, sedges, rushes and other herbaceous plants with linear leaves (or linear non-woody stems) that are densely clumped and are greater than 10 cm in height. Examples of the growth form occur in all species of *Cortaderia, Gahnia* and *Phormium* (see also Flaxland) and in some species of *Chinochloa, Poa, Festuca*, *Rytidosperma*, *Cyperus*, *Carex, Uncinia, Juncus, Astelia, Aciphylla* and *Celmisia*.

[1] This is a measure of the importance of a species in relation to other species in the same area of interest (e.g. the same habitat type or forest tier), and is not simply a frequency count (biomass as well as density contribute to the importance of any given species to the area of interest).

[2] Altitudinal zonations are not fixed and the elevation at the point of change between any two zonations will exhibit variance across the landscape. There are obvious patterns in vegetation cover along an altitudinal gradient, with the change in climatic conditions as altitude increases being reflected in a change in vegetation cover. Specifically, a change in species composition, growth form (e.g. trees to shrubs to tussocks) and stature (e.g. decreasing in height,

or prostrate) is noticeable. Thus, the shift between altitudinal zonations is more defined by the change in vegetation type (e.g. lowland forest to montane forest) than it is by elevation.

[3] As per Atkinson, I.A.E. 1985. Derivation of vegetation mapping units for an ecological survey of Tongariro National Park, North Island, New Zealand. *New Zealand Journal of Botany 23:361-378*.

[4] Defined in Johnson, P. & Gerbeaux, P. 2004. *Wetland Types in New Zealand.* Department of Conservation, Wellington.