BEFORE THE ENVIRONMENT COURT

Under	the Resource Management Act 1991 ("Act")
In the matter of	appeals under clause 14 of the First Schedule to the Act concerning the Proposed One Plan for the Manawatu-Wanganui Region and the topic of Biological Diversity
between	**FEDERATED FARMERS OF NEW ZEALAND** ENV-2010-WLG-000148
and	**MERIDIAN ENERGY LTD** ENV-2010-WLG-000149
and	**MINISTER OF CONSERVATION** ENV-2010-WLG-000151
and	**PROPERTY RIGHTS IN NEW ZEALAND** ENV-2010-WLG-000152
and	**HORTICULTURE NEW ZEALAND** ENV-2010-WLG-000155
and	**WELLINGTON FISH & GAME COUNCIL** ENV-2010-WLG-000157
and	**MANAWATU-WANGANUI REGIONAL COUNCIL** Respondent

Rebuttal Evidence of
AMY LAURA HAWCROFT
on behalf of the Minister of Conservation and Wellington Fish & Game Council

---

Dated: 14 March 2012

Minister of Conservation
c/-P O Box 462 Tel +64 6 759 0205
55 a Rimu Street Fax +64 6 759 0351
New Plymouth
Solicitors acting: Sarah Ongley / Alice Camaivuna

REBUTTAL EVIDENCE OF AMY LAURA HAWCROFT

1 My full name is Amy Laura Hawcroft. I have prepared evidence on behalf of the Minister of Conservation and the Wellington Fish and Game Council in this matter. In this rebuttal evidence I rebut matters raised in the evidence of Mr Matiu Park, Mr David Le Marquand and Ms Lynn Neeson as follows:

1.1 Criteria for assessing significance and the inclusion of functioning ecosystem services as a 'filter'

2 Mr Park is advocating the use of the term functioning ecosystem processes as a 'sustainability' criterion which may be used to 'filter' sites which qualify as significant under other criteria[1], as he writes that the One Plan provides "*no basis to exclude areas which trigger the default 20% rule... even though a*

[1] Park EIC paragraph 6.11.

habitat type has poor or non-existent ecosystem processes"[2] and "*consideration of a sites condition and ecological functioning... remains vital to this determination of significance*"[3]. First, it is incorrect to state that the One Plan provides "no basis to exclude areas which trigger the default 20% rule". Tables E2a and E2b include a set of limits, debated during council-level caucusing amongst ecologists in August 2008, designed to exclude habitats that are too small or otherwise unsuitable for consideration as significant natural areas. Secondly, beyond those exclusions, in my view it is unacceptable to require that sites must have high ecological value and high condition in order to be considered significant.

3 There are situations in the Horizons region where all existing examples of threatened (less than 20% remaining) and rare habitats are in poor condition and no longer function as they would have prior to human habitation. I previously noted that all of the Manawatu-Whanganui active dunelands are imminently threatened by invasive marram grass.[4] Another example is riparian podocarp forest fragments, which are frequently dominated by mature trees and unlikely to have sufficient recruitment of juveniles of key species like kahikatea until after a catastrophic flood (Miller 2002). Protecting only sites which have currently functioning ecosystem processes could result in near-complete loss of those habitat types and the species they support from the Region.

4 Mr Park suggests that there is a good understanding by ecologists of how criteria for assessing significance are defined and interpreted[5] and refers to a document by Norton and Roper-Lindsay in 1999 that sets out a framework for assessing significance under the RMA. This draft policy document was never adopted (Norton & Roper-Lindsay 2008). Mr Park does not mention two more

---

[2] In passing, Mr Park mentions rare and at-risk habitats that may trigger the default rule being that 20% or less of that habitat remains. This does not reflect the premise of those habitats' inclusion in Schedule E. At-risk habitats are understood to have >20% remaining. Rare habitats were not tested against the 20% threshold as they have always been of very limited extent.

[3] Park EIC paragraph 7.5.

[4] Hawcroft EIC paragraph 98.

[5] Park EIC paragraph 6.2.

recent publications which directly addressed the application of criteria to assess significance under the RMA, and which I now discuss.

5 Norton and Roper-Lindsay presented their work in the New Zealand Journal of Ecology in 2004, and proposed four key criteria: rarity and distinctiveness, representativeness; ecological context; and sustainability to be applied by territorial local authorities to "*assess the relative values of different sites in order to determine where they must provide support to protect biodiversity*". Further, they suggested that sustainability (comprising continuation of ecological processes; resilience to threats; and feasibility of accommodating protection within existing usage) be applied as a qualifier of the other three criteria.

6 This work was critiqued in a paper by seven New Zealand ecologists (Walker et al. 2008a)[6], who disagreed with the requirement for sustainability, for the following reasons:

a) It may bias protection towards naturally resilient habitats over those that are more vulnerable. Protecting only some types of habitat cannot maintain the full suite of regional biodiversity.

b) It cannot account for landscape-scale relationships between sites. E.g. many small remnants of forest in the lowland plains are too small to sustain populations of the birds needed to pollinate and disperse seeds of the canopy trees that form those forests. However, a viable meta-population[7] of birds can exist in the wider landscape, making use of multiple patches at different times.

c) It does not accommodate natural dynamism. Most habitat types are on a trajectory of change, and the change itself is important for

---

[6] While I consider there to be merit in the ecological elements of this critique I do not endorse all of the points made by Walker et al (2008).

[7] Margules and Pressey (Margules, C.R.; Pressey, R.L. 2000: Systematic conservation planning. *Nature 405*: 243-253.) explain this term as "*a network of local populations linked by dispersal. More narrowly, [it] is used to describe systems in which local populations periodically go extinct with recolonisation occurring by migration from other local populations… [metapopulation theory] calls for the retention of landscape linkages to promote dispersal … and for the retention of patches of suitable but currently unoccupied habitat.*" (p. 247)

maintaining biodiversity. For instance, the ephemeral wetlands associated with dune slacks will by their nature gradually in-fill with sediment or be over-run by a mobile dune. However regarding these systems as insignificant because they ephemeral and therefore unsustainable would not recognise all of the Region's ecosystem types. Requiring sustainability may bias protection to slower-changing forested habitats.

7 I disagree with Mr Park[8] that 'representativeness' is the overriding criterion for ecological evaluation. I believe Mr Park is wrongly assuming that the criteria developed and adopted during the Protected Natural Areas Programme (PNAP)[9], which commenced in 1982, are also the basis of significance assessment under the RMA. While similar, the PNAP identified 'representativeness' as an over-arching criteria because it was specifically developed to "*identify and secure protection of the areas that best characterise the range of natural diversity*" (Myers et al. 1987). As stated in Norton and Roper-Lindsay (2004) the PNAP was established to meet the conservation objectives of the Reserves Act 1977 section 3(1)(b) *"...the preservation of representative samples of all classes of natural ecosystems and landscape which in the aggregate originally gave New Zealand its own recognisable character*". This is only one of the necessary steps towards the goal of halting the decline in New Zealand's biodiversity. Both Norton and Roper-Lindsay (2004) and Walker et al (2008) are clear in their opinion that the PNAP assessment criteria are not equivalent to the criteria for assessing significance under the RMA.

8 Finally, Mr Park states that there are no nationally endorsed ecological assessment criteria. Although it is correct that there is no operative national policy statement setting such criteria, the Statement of National Priorities for Protecting Biodiversity on Private Land (Ministry for the Environment 2007) provides clear national guidance on criteria for identifying significant areas.

9 Mr Park's position seems to be that any habitat must meet both the 'functioning processes' and another of the criteria in Policy 12-6 in order to be

---

[8] Park EIC paragraph 6.4.

[9] The PNAP is explained in footnote 3 of my Evidence in Chief.

considered significant. This is not agreed by New Zealand ecologists or endorsed in national policy direction. It is of great concern because the vast majority of places in the Region, including the best remaining examples of some rare and threatened ecosystems (e.g. dunelands) and critical habitat for endangered species (e.g. the rocky habitats that support small-scaled skink) might not be considered significant. The very processes that make species (predation and competition) and habitats (clearance and the ongoing outcomes of fragmentation) threatened also make the survivors unlikely to be judged 'sustainable'.

1.2 The requirement for site specific assessments to determine significance

10 Mr Park states that it cannot be assumed that all rare, threatened and at-risk habitats in Schedule E are automatically section 6(c) areas, but require site specific assessment to determine their significance.[10] He quotes my council-level evidence where he states that I endorsed the need for a site-visit approach.[11] The quotation cited does not conflict with my current position. I believe that site-specific assessments will be needed in order to:

a) confirm that rare, threatened or at-risk habitats are in fact present in the area (e.g. collect information about the habitat's size, location, structure and species composition to determine whether it meets the description in Table E1 and is not excluded by the criteria in Tables E2(a) and (b)); and

b) determine whether at-risk habitats are significant in terms of the criteria in Policy 12-6.

11 Mr Park[12] quotes me again as follows: "*it is much preferable to have a process that triggers an inspection that will be site-specific and up to date, rather than relying on patchy and dated information.*" As stated, I do believe that a site visit may be needed to assess which habitat is present 'on the ground' and this

[10] Park EIC paragraphs 4.1 – 4.4.

[11] Park EIC paragraph 4.1.

[12] Park EIC paragraph 4.2.

information needs to be 'up to date'. This is to be provided free of charge from the Council where a layperson cannot identify whether, for example, a habitat is *Rimu/tawa-kamahi forest* (threatened) or '*Podocarp/kamahi forest* (at-risk).[13] Ms Barton explains this process in her evidence.[14] This is preferable to a scheduling or mapping approach, which will often not be 'up to date'.[15] However additional assessments in a site visit (especially in relation to 'condition' or 'sustainability') are not required for rare and threatened habitats. Additional assessments will only be required for at-risk habitats, for instance to determine the presence of threatened species.[16]

12 As I explain in the following section of my evidence, it is extremely unlikely that (using the criteria that were agreed at caucusing in January 2012), a site visit would lead to a different outcome for a 'rare' or 'threatened' habitat than would be derived from examination of Schedule E. As long as the site visit confirmed that the type of habitat 'on the ground' met the description for either a rare or threatened habitat in Schedule E, it would be significant:

a) 'Rare' habitats would be significant under 12-6 (a) (ii)(E); and

b) 'Threatened' habitat would be significant under 12-6 (a)(i)(A).

1.3 Potential error in indentifying threatened habitat

13 The only circumstances in which a site visit could re-assess the significance of a rare or threatened habitat would be if it corrected some error in the underlying information used to create Schedule E. This is very unlikely.

---

[13] The Introduction to Schedule E states: "*It is recommended that a suitably qualified expert is engaged for assistance with interpreting and applying Schedule E. This could be (a) a consultant ecologist, or (b) the Regional Council staff, who currently provide this service free of charge, including advice and a site visit where required in the first instance.*"

[14] Barton EIC paragraph 55(b).

[15] For example, coastal cliff ecosystems, like those north of Whanganui at Castlecliff, migrate inland as the cliff is eroded. This can happen rapidly, and a map created some years ago could now encompass part of the beach, not the cliffs themselves.

[16] In which case an at-risk habitat would be significant under the criteria in Policy 12-6(a)(ii)(A).

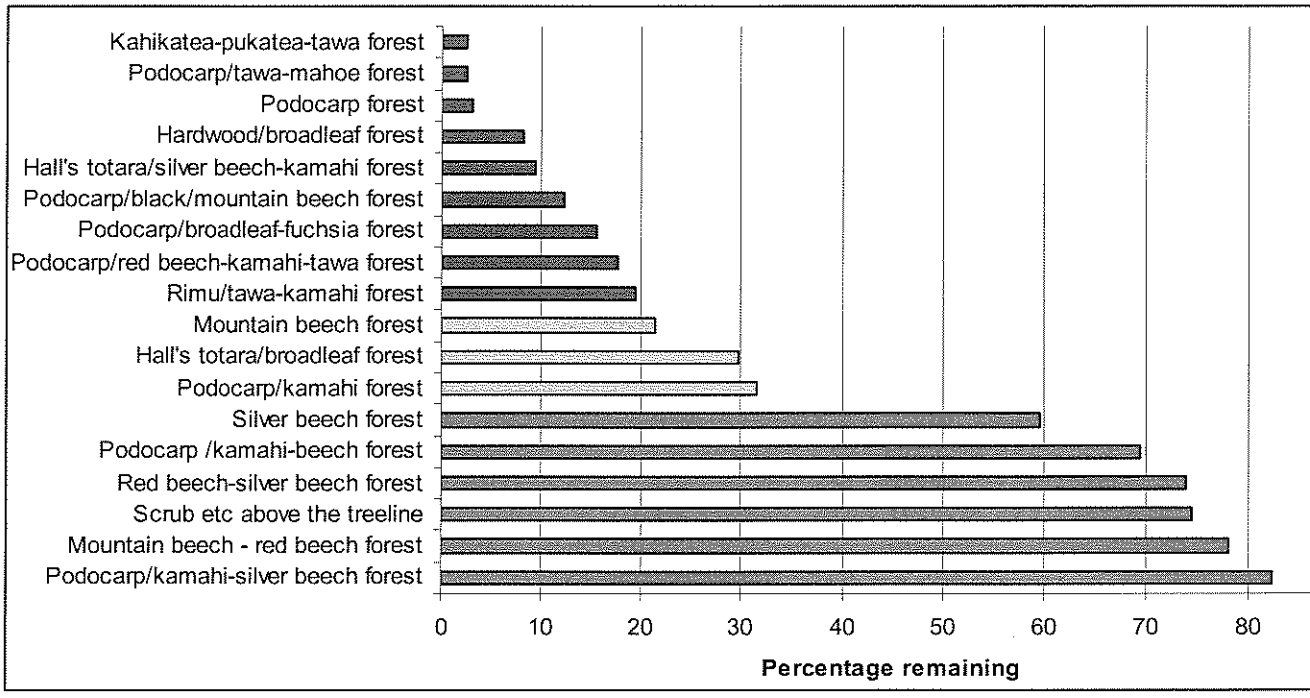
14 In the case of 'threatened' habitat, a different outcome could only be arrived at where an error was made in mapping either the original or current extent of a forest type, which could potentially affect the list of 'threatened' habitats, and the application of criterion (a)(i)(A) in Policy 12-6[17]. There is a small chance that inaccurate modelling of the original extent of a particular forest type (for instance because of patchy availability of soil and weather data or because of poor information about environmental tolerances or prehistoric dispersal limits of species) could have resulted in erroneous conclusion that a forest type was originally very extensive and so less than 20% remains, when actually that particular type was of limited extent and so a greater percentage remains. However, a site visit will not provide any further information about the original extent of a forest type. Future research of the relationships between tree species distributions, dispersal limitations, and abiotic conditions across the landscape could result in more accurate predictions, but that is outside the scope of a site assessment.

15 The graph below indicates current extent of habitats in Horizons Region. Habitats classed as 'threatened' are shown in red, 'at-risk' in orange and 'no threat category' are in green. Note that three habitats (*Rimu/tawa-kamahi forest; Podocarp/red beech-kamahi-tawa forest; and Podocarp/broadleaf-fuchsia forest*) are close to the 20% threshold.[18]

---

[17] Policy 12-6(a)(i)(A): "*comprises indigenous habitat type that is under-represented (20% or less of known or likely former cover).*"

[18] Data taken from Maseyk, F. 2007: Past and current indigenous vegetation cover and the justification for the protection of terrestrial biodiversity within the Manawatu-Wanganui Region: technical report to support policy development. Horizons Regional Council, Palmerston North. 116 p.. Excludes habitat types added based on expert consultation and those included after the Council level hearing.



16 The historic extent of a habitat cannot be directly measured, so instead of using survey data to generate local predictions, authors tend to apply the same tools, such as LENZ, used in the preparation of Schedule E (Smale et al. 2009 7). A site visit would not resolve any errors with such models, unless resulting data was used to re-run the modelled relationship between communities and landforms, which is very unlikely.

17 A site visit might resolve errors associated with inaccurate mapping of *current* extent of indigenous forest. However, these errors are likely to result in *over*-estimation of the current extent of the indigenous habitat. Correction of such errors would render the habitat-type even more threatened than was otherwise understood. A review of sites that changed status from indigenous forest in LCDB1 to plantation forest in LCDB2[19] found that the most common sources of error were LCDB1 wrongly classifying areas of pasture with scattered shrubs, exotic forest or exotic shrubland as indigenous[20] (Brockerhoff et al. 2008).

---

[19] I described the LandCover database in footnote 13 of my EIC. Version 1 was created using imagery from 1996/97 and version 2 using images from 2001/2002. Version 2 uses a finer resolution of classification and also provides more detailed list of vegetation types (e.g. the LCDB1 cover class 'scrub' was refined into 8 classes, from fernland to grey scrub in LCDB2).

[20] That study did not examine LCDB2's ability to correctly classify indigenous forest.

Such a finding (that there is less indigenous forest cover than previously thought) would make the actual percentage remaining smaller, therefore making a forest habitat type more threatened.

18 So although Mr Park advocates for site-specific assessments to correct for error associated with predictive modelling, it is important to note that site assessments will not:

a) improve estimates of historic extent of an ecosystem type, as this cannot be directly measured; or

b) provide better information about the current extent of the habitat type across the whole region.

19 A site assessment may potentially provide some information regarding current extent of the habitat type. This could finely adjust percentages of indigenous habitat type remaining in the Region, but this would likely be a downwards adjustment rather than an upwards adjustment (and, depending on the size of the habitat and the site, this would be unlikely to be an important change).

1.4 Potential error in mapping rare habitat

20 Similarly, the potential for error in identifying whether a habitat is 'rare' or originally uncommon is not an outcome of the Schedule E approach of identifying significant habitats through description rather than mapping/scheduling. This potential for error is an outcome of the developing understanding of New Zealand's ecology, especially of habitats which have not been the subject of much research.

21 The same risk faced during creation of Schedule E will apply during a targeted site visit or preparation of a map or schedule of significant areas. An ecologist might visit a site, identify that it is a limestone tor, review the literature - Williams et al (2007) - and conclude it is an originally rare habitat type and therefore significant. If future research re-evaluates the national rarity of limestone tors, the ecologist might draw a different conclusion.

22 In my Evidence in Chief I have indicated that I agree with Mr Park[21] that all examples of Cliffs, scarps and tors (and of Screes and boulderfields) may not necessarily be considered significant, because there is some uncertainty as to whether all such habitats were originally rare in New Zealand.[22]

23 I disagree with Mr Park's interpretation of the significance of rare ecosystems resting solely on whether or not they can be shown to support a rare or threatened species at a particular point in time.[23] Mr Park states[24] "... *I contend that including such areas on the basis of substrate alone is inconsistent with the intention of section 6(c) which provides for the protection of significant indigenous vegetation and significant habitat for indigenous fauna. Further, I consider that by including physical substrates within the rare habitat types on the premise that these areas may potentially contain rare species, means that a site visit is imperative to ground truth the supposition.*"

24 The One Plan includes four habitat types where bare substrate may be an important component. These are '*Cliffs, scarps and tors*'; '*Karst systems*'; '*Screes and boulderfields'* and '*Active dunelands'*. Under Policy 12-6(a)(ii)(E), such habitat types are currently considered to be rare and deemed significant if they "*support an indigenous species or community of species*".[25] There is no requirement that the species supported by these habitats be rare or threatened.

25 I had understood that Policy 12-6(ii)(E) had been agreed as it is not under appeal. However given that Mr Park has raised the matter, I will briefly explain why rare habitat types do not need to contain rare species in order to be significant. Protecting sites which support currently threatened or rare species is not the same as protecting significant indigenous vegetation and habitat of indigenous fauna. Such substrates may support important populations or communities of relatively widespread and abundant species. Such species

---

[21] Park EIC paragraph 4.9 - 4.11.

[22] Paragraphs 104-108 of my EIC.

[23] Park EIC paragraph 4.10-4.11.

[24] Park EIC paragraph 4.11.

[25] Policy 12-6(a)(ii)(e): *"was originally (ie., prehuman) uncommon within New Zealand, and supports an indigenous species or community of indigenous species".*

may occupy these habitats periodically, either through seasonal migration or as part of a meta-population. Further, many of these rare habitats, such as limestone outcrops, are irreplaceable: they cannot be re-created easily. In my view they are therefore significant habitat for indigenous fauna.

26 While a site visit to confirm whether a rare habitat meets the criteria in Schedule E should be reasonably straightforward, relying on site visits to determine the presence of rare species is risky and error-prone. Mr Park uses the example of two days field work by a team of three that failed to establish any rare or threatened flora or fauna in the context of Project Central Wind just out of Waiouru.[26] This level of search may still be insufficient to determine whether species are using a habitat. In the case of herpetofauna, a 2011 survey for small-scaled skinks (which occupy limestone, papa and pumice bluffs, screes and outcrops in the central North Island) has found skinks to be present in two sites where they were searched for but not detected in 1991 (Nelson-Tunley 2011). In another case, a student spent two days surveying potential habitat. While the visual search method did not detect any skinks, tracking tunnels left in potential habitat indicated the animals were present. As stated, I did not consider that this matter was in issue however as there is no appeal point on it.

1.5 Summary

27 In summary, based on the significance criteria for Policy 12-6 set out in the Record of Expert Conferencing[27], my opinion is that there is no more potential for error in the application of Schedule E determining rare and threatened habitats as significant than in a series of targeted site visits to assess significance of each rare and threatened area as resource consent applications arise (as will happen for at-risk sites). Schedule E reflects current understanding of such matters as former habitat cover, existing habitat cover, and originally rare habitats within New Zealand. It is appropriate for the Horizons One Plan to contain the premise that rare and threatened habitats

---

[26] Park EUC paragraph 4.11.

[27] Memorandum Regarding Record of Technical Conferencing on Monday 30 January 2012 on Biodiversity: Mr Park has since stated that he no longer agrees with this Record: paragraph 4.14 his EIC.

under Schedule E, if they exist on the site in question, are significant areas for the purposes of section 6(c) of the Act.

1.6 Application of Schedule E

28 Ms Neeson describes[28] a situation of felling trees (a kahikatea and two whitey woods) associated with track maintenance, which would require a consent under the One Plan. Track maintenance and upgrading is excluded from the definition of "vegetation clearance and land disturbance" in the One Plan (Glossary). Creating a *new* track will require an assessment to determine whether Schedule E is applicable, but Table E2(a) requires that in order to be applicable, forest or treeland be continuous and cover more than 0.25ha. Therefore it is unlikely a small number of scattered trees would form the entirety of a habitat requiring a resource consent under the One Plan.

29 Ms Neeson states that the trees were on the edge of a larger patch however, in which case the site assessment would be needed to establish whether they are part of the forest or not. If they are found to be part of the habitat (and its total area is greater than 0.25ha) then this would trigger a consent application. The ecologist would judge whether cutting those trees would have a more than minor affect. Cutting several trees could potentially compromise the values associated with a small patch of forest. For instance if the kahikatea is a large female tree, it will be a significant source of seeds and of seasonal food for birds. In contrast removal of some small trees, especially of species common elsewhere in the immediate area, may not compromise the habitat.

1.7 Initial assessment of the location of rare and threatened habitats

30 Mr Le Marquand has suggested that the uncertainty associated with Schedule E will make high level operational planning difficult, because developers cannot refer to a map indicating presence of significant vegetation or habitat.

31 Nationally, information is available about the probable location of wetlands through W.O.N.I (Ausseil et al. 2008) and an indication of likely 'threat status' of remaining indigenous vegetation is available through the Threatened

[28] Neeson EIC paragraph 24.

Environment Classification (T.E.C).[29] Regional information about the location of wetlands and the predicted occurrence of threatened forest types can be obtained from Horizons, including GIS mapping layers. Some information is available as to the distribution of originally rare habitats (e.g. in Worthy 1990; Hilton et al. 2000) and this is the subject of ongoing research by DOC and Landcare Research. I acknowledge this information is at a coarse scale and may require ground truthing, but it will assist with high level, desk-top planning.

32 An example of this approach is described in the report undertaken by Wildlands Consulting Ltd for the purposes of informing the Assessment of Environmental Effects for the proposed Puketoi Windfarm in north Wairarapa. The probable occurrence of threatened forest types was mapped from LCDB2 and the T.E.C., and of rare ecosystem types was mapped from aerial photographs and existing literature. This was used to inform the initial design, and then more detailed inventories were conducted in the sites likely to be affected by development (Wildlands Consultants Ltd 2011).

1.8 Extent of biodiversity remaining in Ruapehu District

33 Finally, I would like to discuss some points made by Ms Neeson as to the status of biodiversity in Ruapehu District. Ms Neeson[30] considers that Ruapehu District biodiversity has improved over the last 25 years. Biodiversity is a large and multifaceted thing to measure, and there are indeed examples of great gains in Ruapehu District. For instance, work by DOC, Horizons, iwi and local landowners to establish predator trapping over more than 50km of the Manganui o te Ao and Retaruke Rivers (supported by the Central North Island Blue Duck Trust) has seen the number of whio increase substantially since the project began in 2004, exceeding the target of 50 breeding pairs (Campbell et al. 2010). This is an excellent example of collaborative work to protect and enhance biodiversity.

34 However, other aspects of biodiversity have declined. More than 600ha of indigenous vegetation were cleared in Ruapehu District between 1996/97 and 2001/2002 (Walker et al. 2008b). Wetland conversion is ongoing: in 2005, DOC

---

[29] Described in my EIC footnote 15.

[30] Neeson EIC paragraph 19.

Whanganui Area Staff re-visited 17 wetlands that were prioritised as Recommended Areas for Protection (Bibby et al. 2000) five years earlier. They found that two would no longer be classed as wetlands while seven more were still recognisable but - due to weeds, animal use and other processes associated with fragmentation - were much more degraded than during initial inspection. These contrasting trends illustrate the need for a range of mechanisms to retain biodiversity across the Region.

1.9 References

Ausseil, A.; Gerbeaux, P.; Chadderton, L.; Stephens, T.; Brown, D.; Leathwick, J.R. 2008: Wetland ecosystems of national importance for biodiversity: criteria, methods and candidate list of nationally important inland wetlands. Landcare Research Contract Report. Landcare Research, 162 p.

Bibby, C.J.; Beadel, S.M.; Ryan, C.P.; Nicholls, J.L.; Hosking, M.A. 2000: Taumarunui Ecological District. Survey report for the Protected Natural Areas Programme. Contract Report. Department of Conservation, Wanganui. 334 p.

Brockerhoff, E.G.; Shaw, W.B.; Hock, B.; Kimberley, M.; Paul, T.; Quinn, J.M.; Pawson, S. 2008: Re-examination of recent loss of indigenous cover in New Zealand and the relative contributions of different land uses. *New Zealand Journal of Ecology 32*: 115-126.

Campbell, J.; Bristol, R.; Stratford, L. 2010: Securing whio (blue duck) in the Manganui a te Ao and Retaruke Rivers National Security Site. Technical Report 2009/10. Department of Conservation, Whanganui. 26 p.

Hilton, M.; Macauley, U.; Henderson, R. 2000: Inventory of New Zealand's active dunelands. Science for Conservation. Department of Conservation, Wellington. 29 p.

Margules, C.R.; Pressey, R.L. 2000: Systematic conservation planning. *Nature 405*: 243-253.

Maseyk, F. 2007: Past and current indigenous vegetation cover and the justification for the protection of terrestrial biodiversity within the Manawatu-Wanganui Region: technical report to support policy development. Horizons Regional Council, Palmerston North. 116 p.

Miller, C.J. 2002: Conservation of riparian forest remnants, West Coast, New Zealand. *Landscape Research 27*: 125-140.

Ministry for the Environment 2007: Protecting our Places: information about the statement of national priorities for protecting rare and threatened biodiversity on private land. Ministry for the Environment, Wellington. 51 p.

Myers, S.; Park, G.N.; Overmars, F.B. 1987: New Zealand Protected Natural Areas Programme: a guidebook for the rapid ecological survey of natural areas. New Zealand

Biological Resources Centre Publication. Department of Scientific and Industrial Research, Wellington. 92 p.

Nelson-Tunley, M. 2011: Recently discovered popsulations indicate range expansion in *Oligosoma microlepis*. unpublished report. Department of Conservation, 14 p.

Norton, D.A.; Roper-Lindsay, J. 2008: Assessing significance under the RMA - moving forwards: a reply to Walker et al. (2008). *New Zealand Journal of Ecology 32*: 238-239.

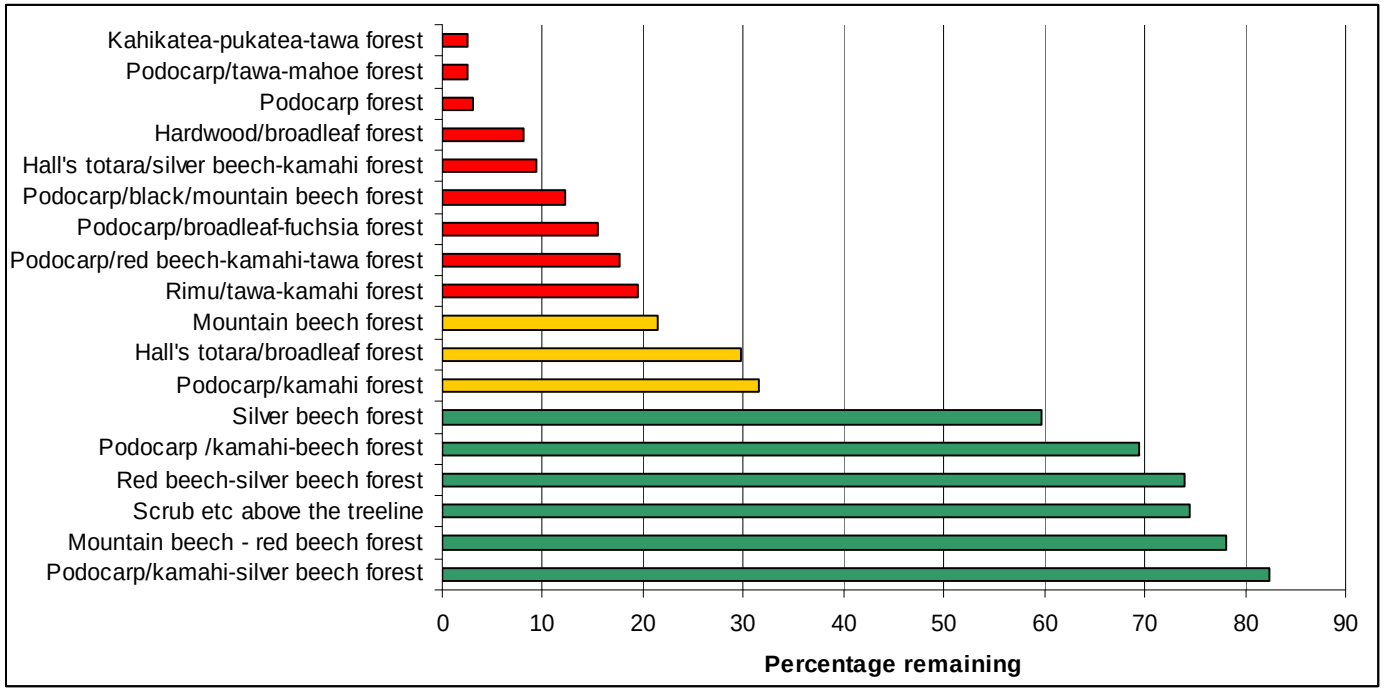
Smale, M.C.; Clarkson, B.R.; Clarkson, B.D.; Floyd, C.G.; Cornes, T.S.; Clarkson, F.M.; Gilmour, D.C.; Snell, T.M.; Briggs, C.M. 2009: Natural areas of Kaipara Ecological District (Northland Conservancy). Reconnaissance report for the Protected Natural Areas Programme. Department of Conservation, Whangerei. 391 p.

Walker, S.; Brower, A.; Clarkson, B.; Lee, W.G.; Myers, S.; Shaw, W.B.; Stephens, R.T.T. 2008a: Halting indigenous biodiversity decline: ambiguity, equity and outcomes in RMA assessment of significance. *New Zealand Journal of Ecology 32*:

Walker, S.; Price, R.; Rutledge, D. 2008b: New Zealand's remaining indigenous cover: recent changes and biodiversity protection needs. Science for Conservation. Department of Conservation, Wellington. 81 p.

Wildlands Consultants Ltd 2011: Terrestrial environments investigation and description, Puketoi Wind Farm, Northern Wairarapa. Contract Report for Mighty River Power Ltd. Wildlands Consultants Ltd, Porirua. 102 p.

Worthy, T. 1990: Inventory of New Zealand caves and karst of international, national and regional importance. Geological Society of New Zealand Miscellaneous Publication. Joint Earth Science Societies of New Zealand Working Group on Geopreservation, 42 p.


Kahikatea-pukatea-tawa forest
Podocarp/tawa-mahoe forest
Podocarp forest
Hardwood/broadleaf forest
Hall's totara/silver beech-kamahi forest
Podocarp/black/mountain beech forest
Podocarp/broadleaf-fuchsia forest
Podocarp/red beech-kamahi-tawa forest
Rimu/tawa-kamahi forest
Mountain beech forest
Hall's totara/broadleaf forest
Podocarp/kamahi forest
Silver beech forest
Podocarp /kamahi-beech forest
Red beech-silver beech forest
Scrub etc above the treeline
Mountain beech - red beech forest
Podocarp/kamahi-silver beech forest
0
10
20
30
40
50
60
70
80
90
Percentage remaining