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Indicator M1: Land under indigenous vegetation

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Prepared for:

Regional Councils' Biodiversity Monitoring Working Group

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1 Overview

In 2010, the Technical Group of the Regional Council Biodiversity Forum worked with Landcare Research to develop the Regional Council Terrestrial Biodiversity Monitoring Framework.[1]

This framework is designed as part of 'a national, standardised, biodiversity monitoring programme, focusing on the assessment of biodiversity outcomes, to meet regional council statutory, planning and operational requirements for sustaining terrestrial indigenous biodiversity'

The terrestrial biodiversity monitoring framework adopts the same approach as the ecological integrity framework designed by Landcare Research for the Department of Conservation (DOC) and consists of three components: (i) indigenous dominance, (ii) species occupancy, and (iii) environmental representation.[2] To inform the framework, there are four broad areas: (i) state and condition, (ii) threats and pressures, (iii) effectiveness of policy and management, and (iv) community engagement.

A standardised monitoring framework ensures that data for each measure are consistent among regional councils, which allows for reliable State of Environment reporting. Furthermore, to enable national reporting across public and private land, it is also desirable that where possible, measures can be integrated with those from DOC'sBiodiversity Monitoring and Reporting System (DOC BMRS).[3] The monitoring framework covers most categories of essential biodiversity variables[4] recommended for reporting internationally, addressing species populations, species traits, community composition, and ecosystem structure adequately, but does not address genetic composition and only in part ecosystem function.

This report contains descriptions of 18 terrestrial biodiversity indicators developed within this framework by scientists who worked with regional council counterparts and representatives from individual regional councils. Each indicator is described in terms of its rationale, current efforts to evaluate the indicator, data requirements, a standardised method for implementation as a minimum requirement for each council, and a reporting template. Recommendations are made for data management for each indicator and, for some, research and development needed before the indicator can be implemented.

The terrestrial biodiversity indicators in this report are designed to enable reporting at a whole-region scale. Some of the indicators are also suitable for use at individual sites of

[1] Lee and Allen 2011. Recommended monitoring framework for regional councils assessing biodiversity outcomes in terrestrial ecosystems. Lincoln, Landcare Research.

[2] Lee et al. 2005. Biodiversity inventory and monitoring: a review of national and international systems and a proposed framework for future biodiversity monitoring by the Department of Conservation. Lincoln, Landcare Research.

[3] Allen et al. 2013. Designing an inventory and monitoring programme for the Department of Conservation's Natural Heritage Management System. Lincoln, Landcare Research.

[4] Pereira et al. 2013. Essential biodiversity variables. Science 339, 277–278.

interest within regions. Each indicator is described in terms of a minimum standard for all councils. If implemented by all councils, each measure can then be aggregated to allow national-scale reporting (e.g. for State of Environment reports, or for international obligations such as reporting on achievement of Aichi Targets for the Convention on Biodiversity). Individual councils could add additional measurements to supplement the minimum standards recommended.

Three of the 18 terrestrial biodiversity indicators – Measures 1 'Land under indigenous vegetation', 11 'Change in temperature and precipitation', and 18 'Area and type of legal biodiversity protection' – were implemented and reported on for all regional councils in June 2014. An attempt to implement and report two others at that time – Measures 19 'Contribution of initiatives to (i) species translocations and (ii) habitat restoration' and 20 'Community contribution to weed and animal pest control and reductions' – was unsuccessful because the data needed for these indicators was either not readily available or not collected in a consistent way, and investment will be needed to remedy these issues before they can be reported successfully.

2 Indicator M1: Land under indigenous vegetation

Author: Jake Overton, Landcare Research

2.1 Introduction

While 40–50% of New Zealand's original indigenous vegetation remains, the distribution of this across land environments is very uneven. Environments that burn easily or lowland areas suitable for human activities often have very little indigenous habitat remaining, while steep, wet or high elevation environments may remain largely indigenous.

Indicator M1 is designed to measure and report on patterns of loss and retention of indigenous vegetation cover relative to potential vegetation cover, and therefore provides a fundamental indicator of environmental representation (i.e. the proportion of environments or potential habitats remaining in indigenous vegetation). This indicator requires a national layer of potential habitat types or environments to estimate original extent, and information on current land cover to estimate current indigenous extent. The indicator provides tables and maps of proportion remaining indigenous (i.e. representation) of the original habitat types, summarised nationally and regionally, and by territorial authorities, and ecological regions within local government administrative regions. Some regional councils will use summaries supplied by Landcare Research, and others will do their own analyses. Ideally, councils will refine the results for their area, by refining the habitat type descriptions for their area, and using fine-scale information on special habitats to provide more resolution of habitats. Future updates and refinements may include new classifications of environments or of potential habitat extent, updated current land cover information, revised methods for assessment of the indigenous content of land cover, and refinements of analyses and presentation.

2.2 Scoping and analysis

Indicator M1 is a fundamental indicator of environmental representation – one of the three components of ecological integrity. While other indicators address various aspects of environmental representation and change, this measure provides the overall picture of patterns of environmental representation across New Zealand. Since this indicator also considers the indigenous component of vegetation, it also addresses the indigenous dominance component of ecological integrity.

Understanding the distributions of remaining habitat types, and in particular, their distributions across environments (i.e. environmental representation) is fundamental to understanding biodiversity loss. While the overall loss of indigenous vegetation cover in New Zealand is moderate, the loss in some environments is critical. This indicator is designed to measure and report on these fundamental patterns of biodiversity, and therefore provides a fundamental indicator of environmental representation (i.e. the proportion of environments or original habitats remaining in indigenous vegetation).

Some discussion of the term 'potential habitat types' as it is used here is warranted. Potential habitat types or ecosystems are similar to – but subtly different from – original or pre- human

habitat types or ecosystems. Original or pre- human habitat types are the actual habitat types that existed at some time in the past (e.g. 1000 AD). In this sense, they are an actual past configuration of habitat types that actually existed, even if we can only estimate what they were. In contrast, potential habitat types estimate what would be present currently in New Zealand, in the absence of any anthropogenic influences or large- scale natural disturbances. These are different from pre- human habitat types because conditions (e.g. climate) might have changed, or species and communities might have changed their distributions for other reasons. Potential habitats also include the influence of biogeography on the distributions of habitats and ecosystems, whereas this is not considered in purely environmental classifications. Thus, when using national potential habitat datasets, regional-based interpretation and narrative will be required.

2.3 Assessment of existing methodologies

This indicator has been developed for the Ministry for the Environment (MfE), various regional councils and the Department of Conservation (DOC) over the past twelve years. Examples of reporting land under indigenous cover, or land under indigenous cover providing context for other reports and analyses include:

- Analyses of biodiversity protection for MfE (Rutledge et al. 2004)
- Analyses of recent loss of cover and threatened environment classification and tools (Walker et al. 2006, 2008)
- Analysis of past and current indigenous vegetation cover and the justification for the protection of terrestrial biodiversity within the Manawatū–Whanganui region (Maseyk 2007)
- Report on indigenous biological diversity in the matter of hearing submissions concerning the proposed One Plan notified by the Manawatū–Whanganui Regional Council (Maseyk 2008)
- Applications to conservation planning and reporting (Overton et al. 2010a).

Most of these analyses used the Land Environments of New Zealand (LENZ; Leathwick et al. 2003) as an estimate of potential or original habitats or ecosystem patterns. Maseyk (2007, 2008) used Potential Vegetation of New Zealand (PVNZ).

Whatever the choice of habitats used for the analyses, it must provide nationally consistent predictions of original or potential habitat types or ecosystems across of New Zealand that will yield consistent predictions at sub-national (i.e. regional) scales. For this reason, habitat type classifications that provide detailed definition of habitat types, but do not provide complete coverage (such as that used by DOC for the ecosystem prioritisation process) cannot be used for this indicator. It should be noted that both LENZ and PVNZ do not include many specialist habitat types for which there is currently no national coverage of original and current extent. This indicator may be improved by individual councils where they have reliable and regionally consistent information on these habitat types not captured by the national datasets.

The basic indicator of environmental representation is the amount and proportion of each habitat type remaining in indigenous vegetation. There is usually interest in having this

summarised in various ways, such as nationally, by local government administrative boundaries, and by ecological regions. Of these analyses, most have used a simple binary classification of current land cover into indigenous and non-indigenous. But Overton et al. (2010a) considered whether the current land cover was also 'natural' (in the sense that the habitat may consist of indigenous species, but has been induced by human interference) relative to the potential vegetation, including degradation of various indigenous habitat types.

2.4 Indicator definition, data and analysis

2.4.1 Definition

Indicator M1 requires a nationally comprehensive layer of potential or original habitat or ecosystem types, together with current land cover information. Each current land cover type is designated as either indigenous or non-indigenous. The fundamental indicator of representativeness of each habitat type is defined as the proportion of the potential or original habitat type that remains in indigenous vegetation. The total areas of original and remaining indigenous vegetation are also reported. These analyses are reported nationally, by local government administrative boundaries, and by ecological regions.

2.4.2 Data

Potential habitat types

The methodology for M1 uses the PVNZ as the potential habitat classification, augmented by each regional council with information on additional habitat types present in the region and not depicted by PVNZ. Potential vegetation predicts for all terrestrial parts of New Zealand, the vegetation that would be expected currently if humans had never arrived. Within forested areas, the predictions of composition are based upon the extensive work of John Leathwick, which modelled the potential distributions of canopy trees in relation to environmental attributes. Additional habitat types have been added from historical and palaeological evidence. The potential habitats also include important biogeographic effects that influence species distributions and ecosystem characteristics, particularly the beech gap. A number of additional habitat types have been added from information in the New Zealand Land Cover Database (LCDB; most recent iteration as LCDB4). Estimates of wetland extent have also been updated, using estimates of original wetland extent by Ausseil et al. (2008) for the Waters of National Importance (WONI) project.

More detailed methods behind PVNZ can also be found at https://lris.scinfo.org.nz/layer/289-potential-vegetation-of-new-zealand/

Each of the forest classes in PVNZ is given a name based on forest class naming standards. These are names for classes of forest, rather than an explicit description of all of the species that ought to be present, and there are only 20 such names for New Zealand, and therefore they represent broad-scale and generalised patterns only. It is expected that some of the species in a class will not be found across the entire geographic distribution of the class. For example, the class 'Kauri/northern broadleaved forest' has been observed to extend south of the distribution of kauri. Similarly, a class such as 'Hall's tōtara–miro–rimu/kāmahi–silver

beech–southern rātā forest' may occur in regions where there is no southern rātā, but which do have a suite of species that are associated with southern rātā in other locations. It is reasonable for councils to amend the names of habitats in their region to make the classes more regionally valid (e.g. to remove a species from the name that does not occur in their region).

There is considerable scope for improvement of the PVNZ. There are many uncharacteristic or naturally uncommon ecosystems (cf. indicator M12) that are unrepresented in the PVNZ. It is quite feasible to include these habitat types where information on their original or potential extent is available across New Zealand, and councils may wish to update habitat types in their region if they have improved information at the regional scale. Councils will need to carefully balance incorporation of new information and integrity of the overall classification. For example, the process of updating the potential extent of wetlands based on new wetland information results in areas the PVNZ identifies as wetland now being classified as non-wetland, but there is no alternative vegetation classification offered within the PVNZ. To solve the problem in the interim, an additional class 'wetland discrepancy' has been added. This will need to be resolved by regional councils as better information specific to their region comes to light. There are also known wetland errors on the West Coast of the South Island, which should be resolved in time.

Like LENZ, PVNZ does not include many uncharacteristic habitat types. Councils with more specific information on habitat types for their region should augment the analyses for their region. Care will need to be taken to ensure the national integrity of the indicator remains.

Current land cover

Indicator M1 uses the Land Cover Database (LCDB). Worked examples developed for this report used LCDB2 but for applications of this measure in future, the most up-to-date version of LCDB should be used (currently LCDB4).

Past analyses suggest that some LCDB classifications do not provide reliable estimates of change for indigenous vegetation at the decadal time scale. This should be revisited with successive iterations of LCDB, but it is likely that use of other measures (e.g. Indicator M2, 'Vegetation Structure and Composition') will be needed in conjunction with this indicator to estimate changes in the patterns of indigenous vegetation.

Boundaries

The ecological region and local authority boundaries are used for this indicator. The 2012 versions of the regional, territorial, and unitary boundaries were downloaded from the Statistics New Zealand website and re-projected to the New Zealand Map Grid (NZMG).

Because the coastlines used differ between the layers (ecological regions and local authority boundaries) and also differ between the PVNZ and LCDB information, there are some minor variations in the predicted areas of habitat type extent from different analyses. For the same reason, some pixels do not have assigned values in one or more of the GIS layers, resulting in no values in those areas.

2.4.3 Analysis and application

Some councils will choose to use analyses provided by Landcare Research. Others will choose to perform their own analyses.

Analyses performed by Landcare Research use the data transformed into GIS raster grids. Using a custom-made extension for ArcView 3.2, the grids are combined to get all the unique combinations of potential vegetation, land cover, and the boundaries. The combinations are then used for summarising the amount of each remnant habitat type typology for each boundary (e.g. region, territorial authority, or ecological region). This grid combines results to yield a single grid with a unique ID for each combination. A table gives the values of each grid for that combination, and a count of the grid cells with that combination. Each grid cell represents a fixed areal extent, and multiplying the number of grid cells by this area yields the number of hectares for each remnant habitat in the context of each boundary type. To manage the different combinations of habitat type and boundary type effectively, the table is exported to an Access database to provide the required summaries, which are outputted as Excel files. The results of the Excel table summaries can be linked back to the GIS grid using the unique grid ID to make maps of the variables of interest, such as the proportion remaining of each habitat type, for each region.

Analyses by Landcare Research have all been done using NZMG projection. Given the New Zealand standard is to shift to the preferential use of the New Zealand Transverse Mercator projection (NZTM), future analyses will need to consider any discrepancy in the number of grids that may arise due to the slight distortion between the NZMG and the NZTM projections. (Note that all projections suffer from distortions; both NZMG and NZTM are not equal-area projections and hence, there are small errors in the resulting area values.)

Councils that use analyses provided by Landcare Research may choose to refine the results for their region. For example, the Bay of Plenty Regional Council has considerable confidence in their estimates of original and remaining duneland extent, and these differ from those provided by the Landcare Research analyses. In such cases, regional councils should replace the analyses with their own estimates for their region, and provide their information into a central resource that may be used to improve future versions of the PVNZ. Similarly, as mentioned above, councils may amend the habitat type names to better reflect the species composition in their region.

The approach of combining the LCDB2 with PVNZ to model remaining habitats by type has been successfully used by Horizons Regional Council to develop biodiversity protection

policy for use in its One Plan. The habitat typologies were re-grouped (and at times re-phrased) into typologies that typically match those that are expected. For example, the very specific 'Kahikatea–mataī/tawa–māhoe forest' was redefined as a simpler and generic 'Podocarp/tawa–māhoe forest' due to the propensity for other podocarp species to appear as mixed forest types within the region. Also, for example, the 'Kauri/taraire–kohekohe–tawa forest' typology was re-phrased as 'Hardwood/broadleaf' forest because of the lack of kauri and taraire in the Manawatū–Whanganui region, and typologies such as 'rimu–mataī–miro–tōtara/kāmahi' and 'Rimu–miro–tōtara/kāmahi' are so similar that they can be merged as 'Podocarp/kāmahi'.

The proportion (%) of former extent remaining of these re-phrased habitat types was recalculated and then scaled against two theoretical thresholds for accelerated biodiversity loss: 20% and below of former extent to identify 'Threatened' habitat types and between 20% and 50% of former extent for 'At-risk' habitat types. Habitat types above 50% were excluded from the regulatory methods of the One Plan and have thus not been assigned a threat category.

The development of the policy to protect living heritage is based on these thresholds and threat classifications (Threatened, At-risk), where any activity that results in vegetation clearance or land disturbance of threatened habitats is a 'non-complying' activity, and of at-risk habitats is a 'discretionary' activity. Both classes set a high bar for resource consenting.

The One Plan of Horizons Regional Council also provides an example of needing to supplement the identification of habitat types by the PVNZ with those known to exist in the region but not captured by the model (e.g. naturally rare habitat types).

2.5 Sampling scheme development

Indicator M1 uses spatially extensive GIS information on an existing model of potential habitat types and current land cover depicted in LCDB2. As such, sampling schemes are not germane to this measure.

However, new versions of LCDB (i.e. LCDB4) have been improved by regional councils checking the ground accuracy of the data. To improve the accuracy of LCDB, and maintain some degree of national consistency in the level of accuracy, it may be preferable that the LCDB development team propose a minimum sampling scheme requirement at all councils.

As stated above, improvements to the accuracy and value of the PVNZ relies on councils providing more finely-scaled data for the analysis.

Data management and access requirements

Indicator M1 combines a range of spatial information from different sources. It is the responsibility of the various agencies that provide the information to update the information. The use of the information in indicators may provide additional impetus or funding to update the information. All sources of information are publicly available.

2.6 Reporting indices and formats

Indicator M1 provides fundamental information on overall biodiversity status, useful for reporting and setting of policy.

Several maps should be used to present the indicator, to provide both context and status for this indicator. These are exemplified below using examples from work for Horizons Regional Council's One Plan (Maseyk 2007). The distribution of the different habitat types (Figure 2-1) provides an understanding of the potential distribution and extent of each habitat type. A map of the current remaining habitats (Figure 2-2) provides a comparison for the amount and distribution of the habitat types remaining. A simple graphing of the proportion remaining in the region for each habitat type facilitates a classification into threat categories (Figure 2-3). Threat categories can also be mapped to provide an understanding of their extent and distribution (Figure 2-4).

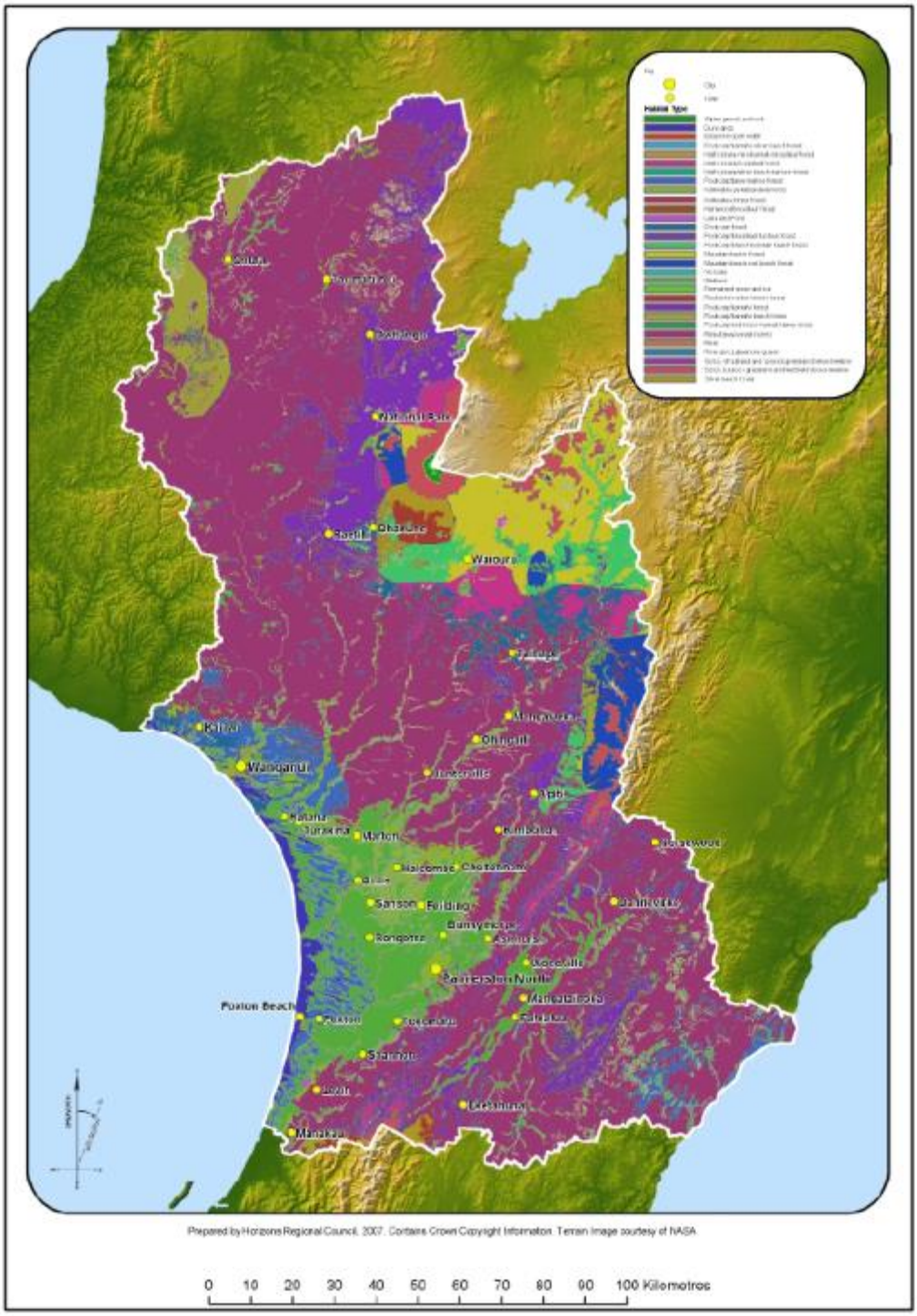

Figure 2-1 Predicted previous extent of indigenous vegetation defined by habitat type in the Manawatū–Whanganui region.

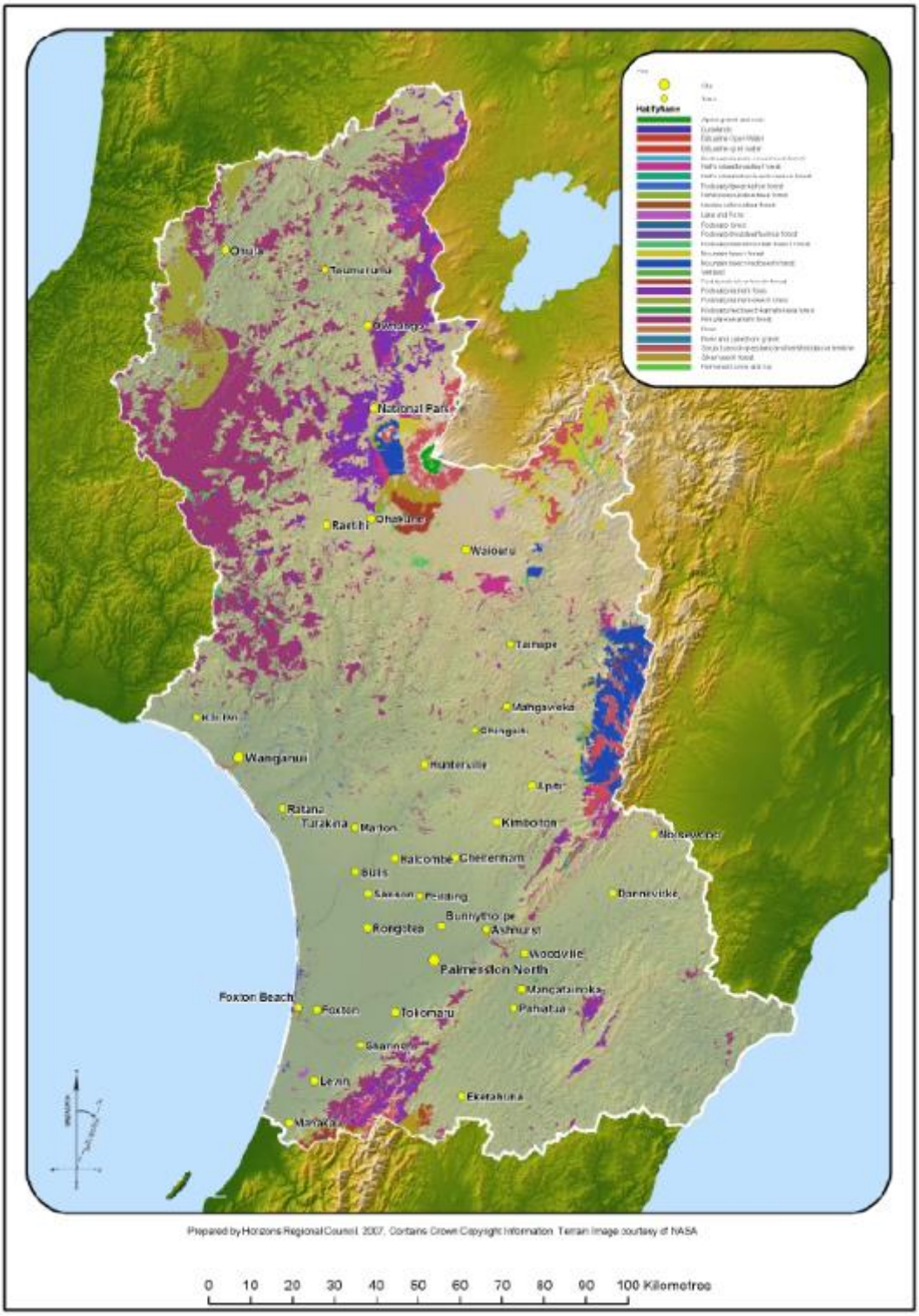

Figure 2-2 Current extent of indigenous vegetation cover defined by habitat type in the Manawatū-Whanganui region. Vegetation cover classes defined in Appendix 1..

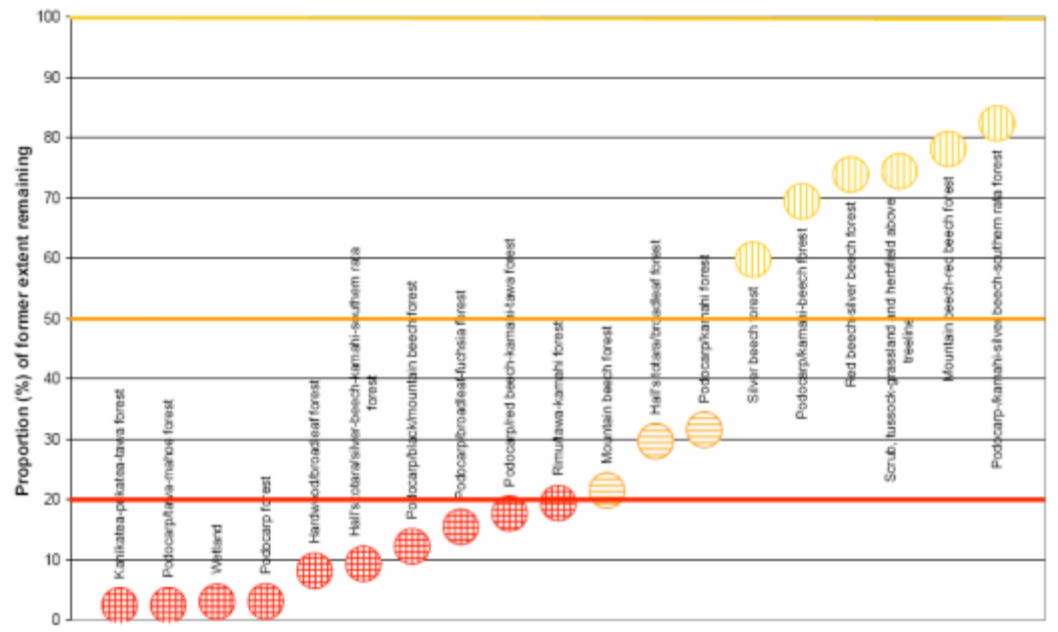

Figure 2-3 Habitat types identified in the Manawatū–Whanganui Region and remaining extent of each habitat type expressed as a proportion of previous extent. Habitat types below the horizontal red line are considered 'Threatened' habitat types (red hatched circles). Habitat types below the horizontal orange line are considered 'At Risk' habitat types (orange horizontal shaded circles). Habitat types below the horizontal yellow line are labelled 'No Threat Category' (yellow vertical shaded circles). From Maseyk (2007).

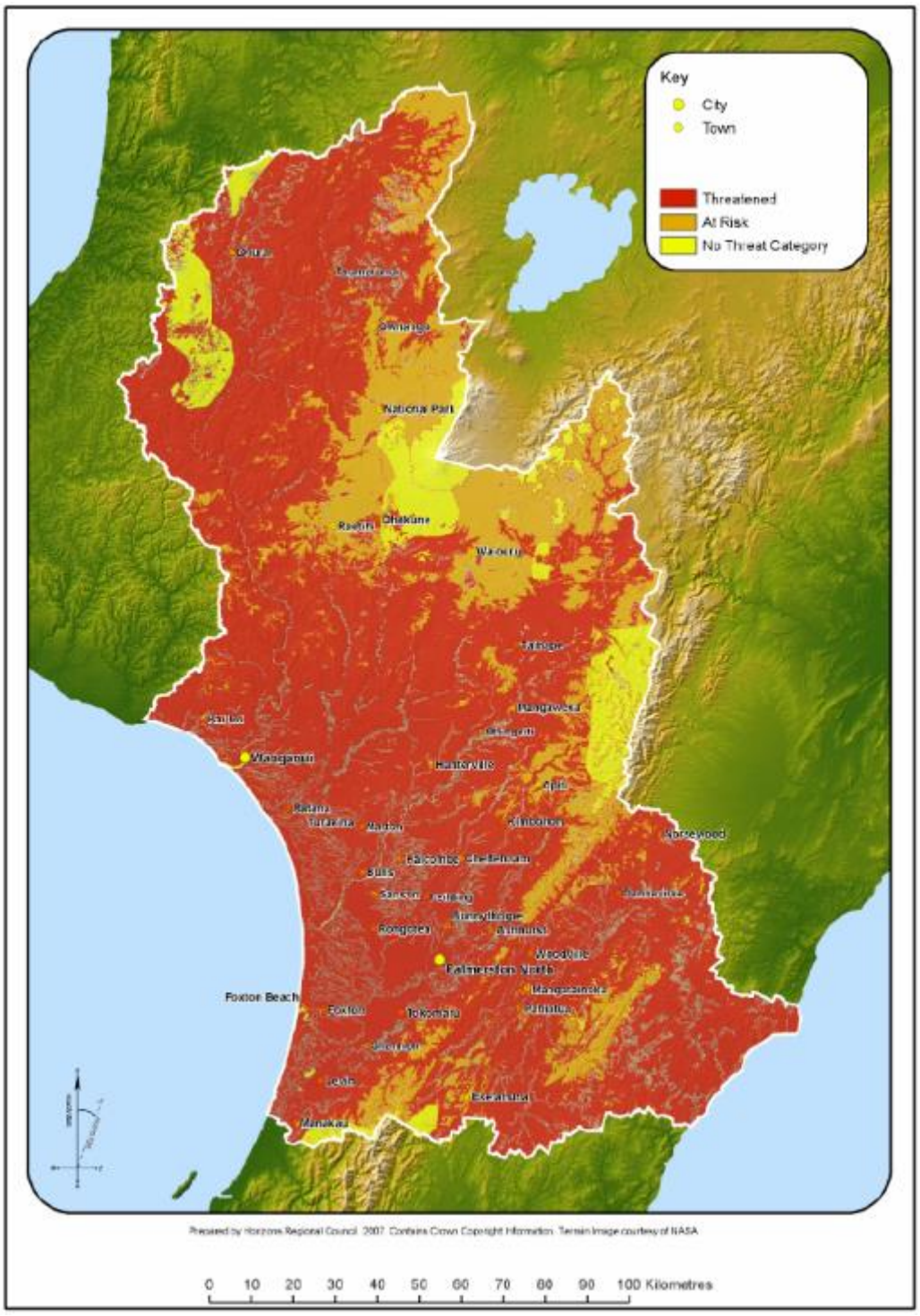

Figure 2-4 Map of the Manawatū-Whanganui Region showing the spatial pattern of Threatened, At Risk and No Threat Category habitat types at a scale of 1:1,080,000.

Behind these maps, a wide range of other applications exist. More detailed information on the breakdown of remaining indigenous vegetation needs to be provided in databases or appendices. These should include tables of the amount remaining and proportion remaining of various habitat types, summarised in various ways, including nationally, regionally, and within political region by ecological region or territorial authority. Three ways of summarising, and the variables provided for each follow:

1. Region. Summaries of the following variables are provided nationally and regionally for each habitat type:

   a. Habitat name
   b. Area Original NZ
   c. Area Remaining Indigenous NZ
   d. Percentage Remaining Indigenous NZ
   e. Area Original Region
   f. Area Remaining Indigenous Region
   g. Percentage Remaining Indigenous Region

2. Region and ecological region. Summaries of the following variables are provided nationally and regionally (a–g), and for each ecoregion within the region (h–l), for each habitat type:

   As above for No. 1–

   a. Habitat name
   b. Area Original New Zealand
   c. Area Remaining Indigenous New Zealand
   d. Percentage Remaining Indigenous New Zealand
   e. Area Original Region
   f. Area Remaining Indigenous Region
   g. Percentage Remaining Indigenous Region

   For each ecological region *i* found in the region–

   h. Ecological region *i* Area Original in Region
   i. Ecological region *i* Area Remaining Indigenous in Region
   j. Ecological region *i* Percentage Remaining Indigenous Region
   k. Ecological region *i* Percentage Contribution to Region Original
   l. Ecological region *i* Percentage Contribution to Region Remaining

3. Region and territorial authority. Summaries of variables are provided as for No. 2 above, but using territorial authority to summarise within region, rather than ecological region.

2.7 Future considerations

There are a number of considerations for the future development of this indicator. The most important are the choice of classification used for the analysis, and how the estimation of indigenous cover remaining is done.

2.7.1 Choice of classification

The choice of classification for potential habitats or environments will have a very strong influence on the results. Currently the PVNZ is used for this indicator. Many previous analyses have used LENZ Level IV, which also forms the basis of the Threatened Environment tool. One notable difference between LENZ and PVNZ is the number of classes, with LENZ Level IV having 500 classes and PVNZ only 24 (20 forest habitats, and 4 non-forest habitats). In both cases, more classes may be added by councils when information on special habitats or ecosystems is available. The larger number of classes in LENZ Level IV means that the environmental patterns are divided much more finely than for PVNZ. This means that there is much more variation in the proportion of classes remaining in indigenous vegetation in analyses done with LENZ Level IV than those done with PVNZ. The results using PVNZ can be seen as a 'coarse focus' view of the status of biodiversity, while those using LENZ Level IV are a 'fine focus'. It is, however, not entirely clear that all of this finer division is biologically meaningful. Overton et al. (2010b) report that the ability of LENZ to predict differences in both snail and beetle communities decreases with the number of LENZ classes used.

It is, of course, possible to use more than one classification, and provide comparisons of the results. Councils may find it useful to compare this indicator with the Threatened Environments classifications when reporting biodiversity statistics to their community. There is a range of other classifications that could also be considered. In particular, the environmental classification in LENZ was not directly informed by biotic data. New generations of LENZ have been generated that use biotic information to optimise the classification to best discern biotic pattern. The new generations of LENZ also include biogeographic effects, which are ignored in the original version of LENZ.

2.7.2 Estimation of indigenous cover remaining

In the current analyses, classes from the LCDB2 are considered either exotic or indigenous. In many of the classes considered indigenous, the vegetation is highly modified from the natural or potential vegetation. In many cases, this will overestimate the amount of indigenous vegetation remaining. A more sophisticated approach is to consider classes as a continuum of 'indigenous-ness' or naturalness. As discussed above, Overton et al. (2010a) developed a method to consider whether the current land cover was natural relative to the potential vegetation.

The consideration of 'indigenous' instead of 'natural' can make a significant difference in the reported statistic. For example, in Inland Otago the current analyses show c. 50% of the vegetation remaining is indigenous (Figure 2-5). This is largely because the current analyses consider highly modified tussock grasslands to be indigenous and natural, even when the potential vegetation is woodland. This contrasts starkly with the results from the Threatened Environment tool, which show much more variance in this region. Although the Threatened Environment analyses also consider tussock grasslands to be native, they use LENZ IV classification, which has a much finer division of the area.

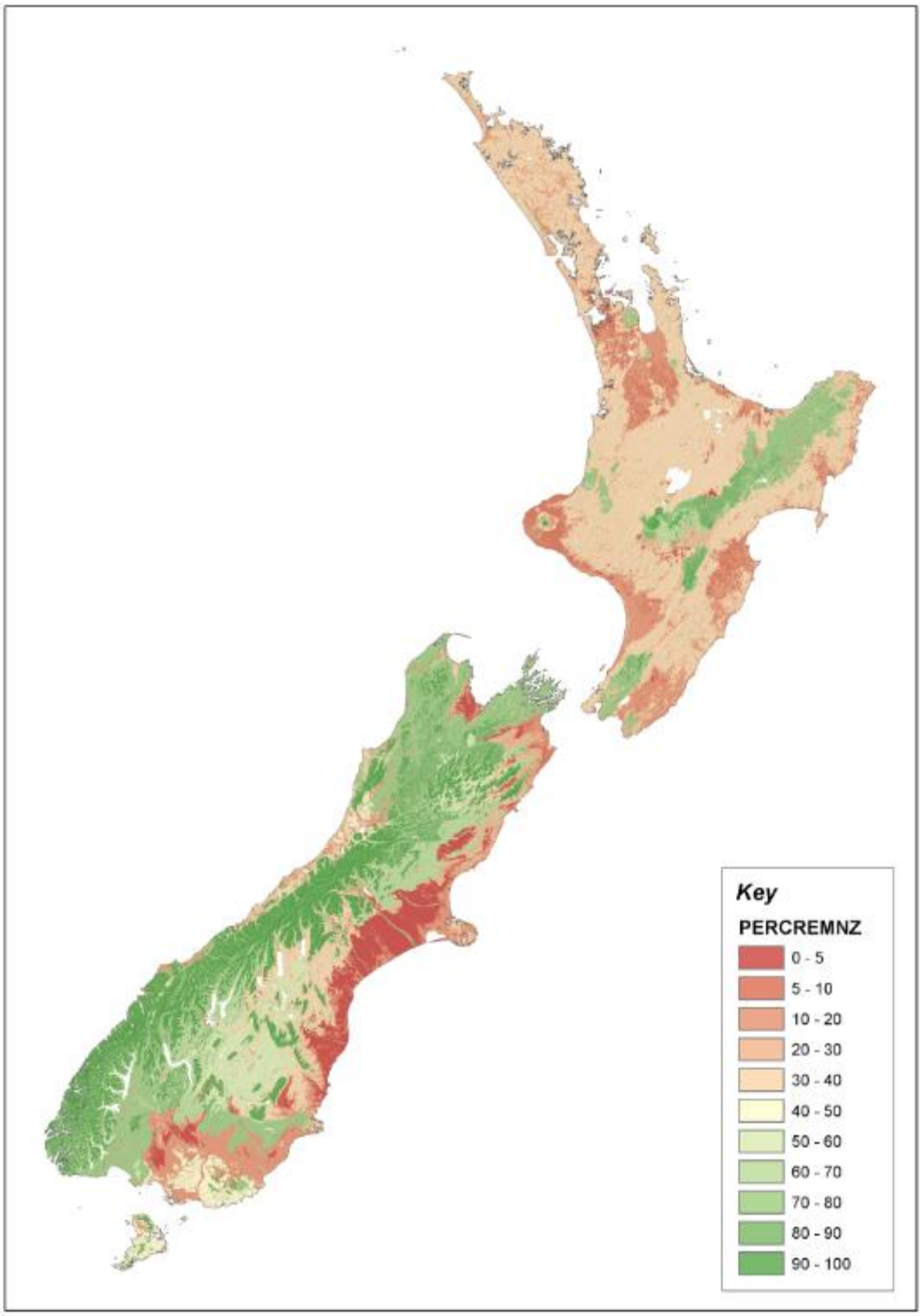

Figure 2-5 Map of proportion of potential vegetation types remaining in indigenous vegetation (PERCEMNZ) for New Zealand.

What is considered indigenous can change in different places. For example, in the analyses shown above from Horizons Regional Council, induced indigenous land cover types, such as mānuka scrub, were separated out in the estimation of areas of remaining indigenous habitat. This is another way to refine the estimation of the indigenous-ness of current land cover in these analyses.

It is worth noting that any changes in classifications or the estimation of indigenous-ness will provide different results.

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Appendix 1 – Land cover classes

Table A1-1 Land cover classes and whether they are considered indigenous in the analyses (0 = No, 1 = Yes).

Grid value	Land cover class	Indigenous
1	Build-up Area	0
2	Urban Parkland / Open Space	0
3	Surface Mine	0
4	Dump	0
5	Transport Infrastructure	0
10	Coastal Sand and Gravel	1
11	River and Lakesore Gravel and Rock	1
12	Landslide	1
13	Alpine Gravel and Rock	1
14	Permanent Snow and Ice	1
15	Alpine Gras / Herbfield	1
20	Lake and Pond	1
21	River	1
22	Estuarine Open Water	1
30	Short-roationa Cropland	0
31	Vineyard	0
32	Orchard and Other Perennial Crops	0
40	High Producing Exotic Grassland	0
41	Low Producing Grassland	0
43	Tall Tussock Grassland	1
44	Depleted Grassland	1
45	Herbaceous Freshwater Vegetation	1
46	Herbaceous Saline Vegetation	1
47	Flaxland	1
50	Fernland	1
51	Gorse and/or Broom	0
52	Mānuka and/or Kānuka	1
53	Matagouri	1
54	Broadleaved Indigenous Hardwoods	1
55	Sub Alpine Shrubland	1
56	Mixed Exotic Shrubland	0
57	Grey Scrub	1
60	Minor Shelterbelts	0

Grid value	Land cover class	Indigenous
61	Major Shelterbelts	0
62	Afforestation (not imaged)	0
63	Afforestation (imaged, post-LCDB1)	0
64	Forest – Harvested	0
65	Pine Forest – Open Canopy	0
66	Pine Forest – Closed Canopy	0
67	Other Exotic Forest	0
68	Deciduous Hardwoods	0
69	Indigenous Forest	1
70	Mangrove	1