

Analysis from data on land ownership, land cover, and the Threatened Environments Classification

Purpose

To determine where high value indigenous cover is located (based on Threatened Environment Classification) and what proportion is in each type of ownership/management (DOC, Māori Land Court, Treaty settlement, Crown, and General/Private land). This analysis particularly considers the distribution of threatened indigenous cover on Māori owned land (Treaty Settlement and Māori Land Court land), as compared to other types of land ownership.

Summary

- The focus of this analysis is on biodiversity within land environments. It does not include freshwater biodiversity or coastal environments.
- We have overlaid land ownership types (Conservation land, Crown land, Māori Land Court Land, Treaty Settlement land, and general/other land), with the Land Cover Data Base (LCDB) and the Threatened Environment Classification. This helps demonstrate who administers the land that contains indigenous cover from the most threatened environments (which is a proxy for biodiversity).
- This analysis using the Threatened Environment Classification shows quite different results compared to considering the distribution of indigenous cover alone. It suggests that, as a percentage of the total land areas in each tenure type, the greatest proportion of the most threatened indigenous forests are found in General land and Māori Land Court Land (0.5% of land area), and that the more legally protected and less threatened indigenous forests are more often found on DOC land (54% of DOC land area).
- ‘General land’ is a broad category and is large – just over half of all New Zealand’s land. By area, our most threatened indigenous land covers occur on General land (70,000 ha of indigenous forest and 52,000 hectares of indigenous scrub)
- However, as a proportion of total land area, General land and Māori Land Court Land both have the highest proportions of indigenous forest from the most threatened environments (0.5% of land area) which is those areas with less than 10% of indigenous cover left. There is also a higher proportion of indigenous forest that is chronically threatened (10-20% cover left) and at risk (20-30% cover left) on Māori Land Court Land (1.8% and 3.1% of land area respectively) than general land (0.6% and 1.1% of land area respectively).
- There are other datasets that show significant biodiversity that isn’t necessarily captured in the Threatened Environment Classification (such as Naturally Uncommon Ecosystems, or threatened species maps). Highly modified landscapes or features can also be habitat for threatened species. There is no easy way to map or identify these, especially nationwide.

Methods and limitations

The GIS analysis described in this paper uses three main datasets:

- LCDB
- Threatened Environment Classification

- Land ownership layers, as a combination of Conservation land (administered by DOC), Crown Land (administered by LINZ), Māori Land Court land, Treaty Settlement Land, and everything else classed as ‘General’ land.

The first analysis simply overlays LCDB with five land ownership layers. The second analysis uses the five land ownership layers, but overlaid with the Threatened Environment Classification (which is a combination of LCDB, Protected Areas Network, and Land Environments New Zealand).

This analysis using the Threatened Environment Classification groups indigenous vegetation into three categories: indigenous forest (combining LCDB’s indigenous forest and broadleaved indigenous hardwoods), indigenous scrub/shrubland (combining LCDB’s Manuka and kanuka, Matagouri or Grey Scrub, Fernland, Sub-alpine shrubland, Mangrove), and tussock grassland. These categories may miss some important biodiversity that may be harder to distinguish, as it might be in a degraded state or mixed with other exotic vegetation. For example, other mixed grassland classes, not covered by this analysis, may include areas of indigenous grass species with high biodiversity values (see appendix 1 for more detail on the limitations relating to grasslands in this analysis).

These GIS analyses also don’t cover all of the biodiversity that one might want to protect (for example, it doesn’t show habitat of significant fauna, threatened species, or naturally uncommon ecosystems). No one dataset shows all of the significant biodiversity in New Zealand, but if we assume that indigenous vegetation as prime habitat for indigenous flora and fauna, then Threatened Environment Classification gives a useful starting point for what, at a minimum needs more protection.

Note that this analysis also does not show where land may be legally protected by QEII or Ngā Whenua Rahui covenants. However, at the national level, the Threatened Environment Classification takes into account the amount of the environment that is already legally protected (such as in public conservation land, QEII covenants or in Ngā Whenua Rahui) in determining the level of threat of a land environment.

More detail on the limitations for this analysis is in Appendix 1, and descriptions and limitations of each of the datasets used in this analysis is in Appendix 2.

This analysis does not cover freshwater biodiversity or the coastal/marine area. It is focused on physical land environments where biodiversity is likely to be present. This paper focuses on indigenous forest and tussock grasslands as these seem to be the vegetation types with most significant differences between ownership groups, but more conclusions could also be drawn about other types of indigenous vegetation or threat categories.

Results of the analysis

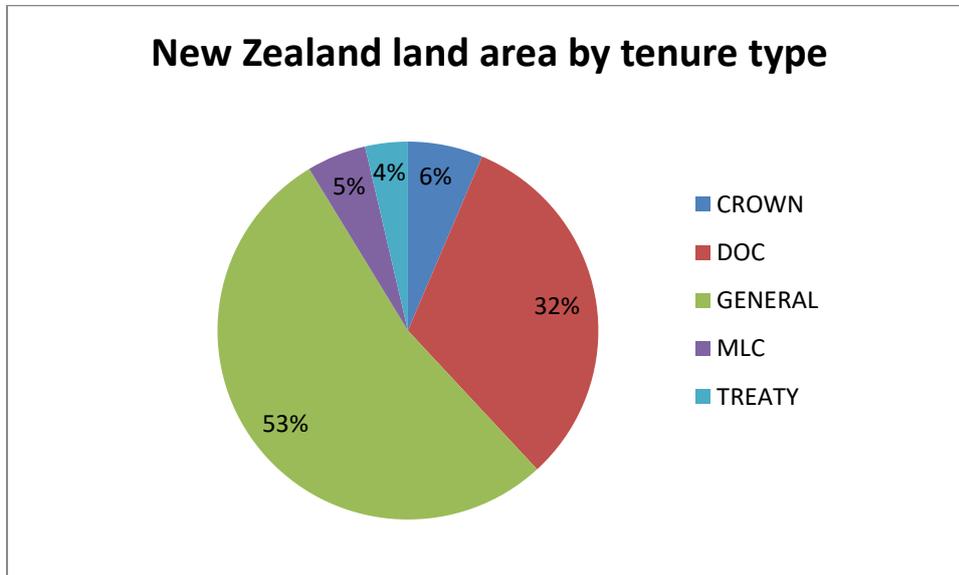
Land Cover Data Base (LCDB), with land ownership type

See Appendix 3 for the tables of data referred to in this section.

Distribution of LCDB medium order indigenous land cover classes by land ownership type, shows how indigenous cover is spread across different land ownership groups (DOC, Māori Land Court Land, Treaty Settlement, Crown and General land).

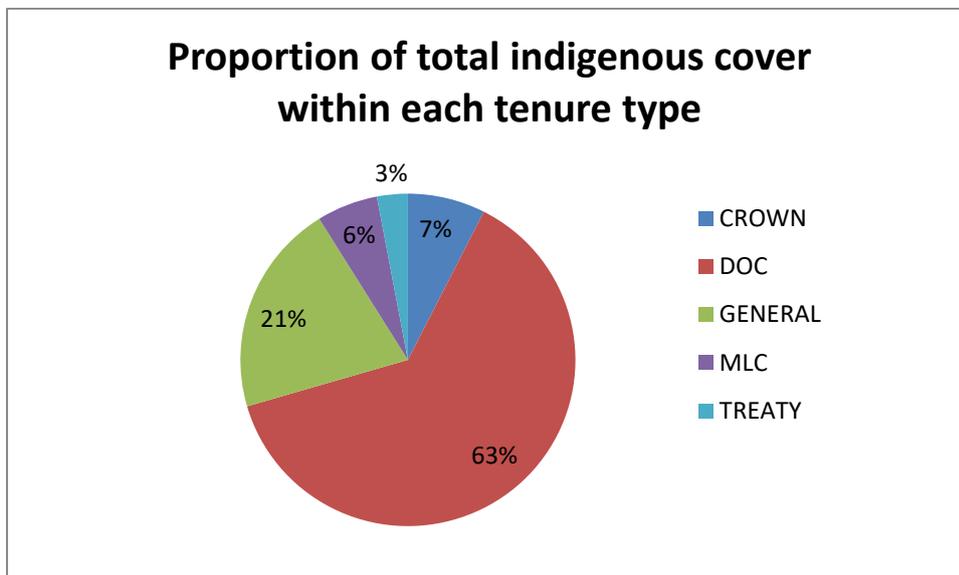
The land ownership layer used in this analysis shows that approximately one third of all land in administered by DOC, half is General land and the remainder is fairly evenly spread between Crown land, Treaty land and Māori Land Court land (Figure 1).

Figure 1: New Zealand land ownership



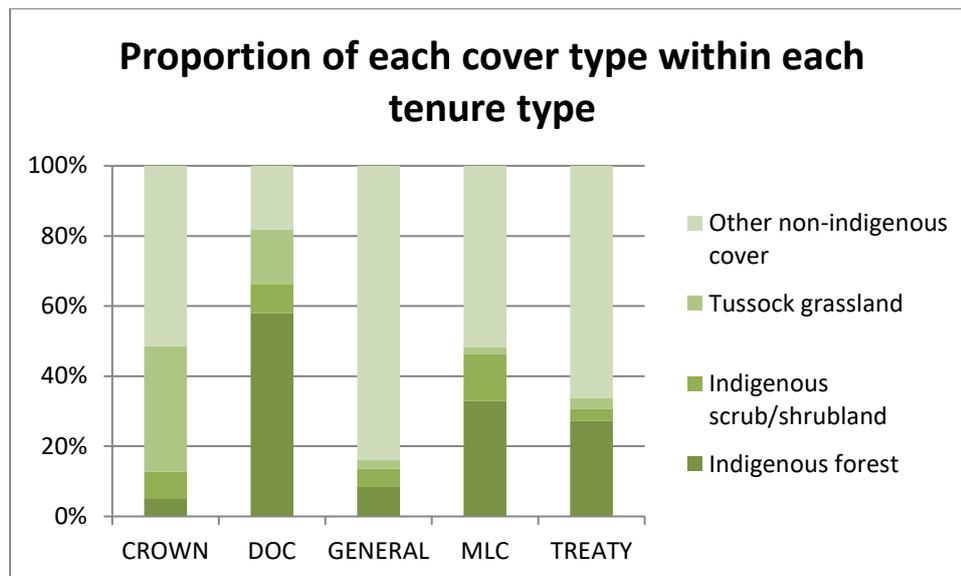
If we consider how indigenous cover is spread over these ownership types we find that 63% is administered by DOC, 21% is in General land, 6% is on Māori Land Court land, 3% is on Treaty Settlement land and 7% is on Crown land (Figure 2).

Figure 2: Distribution of indigenous cover



Figures 1 and 2 show that indigenous cover is not evenly distributed across different tenure types. Figure 3 shows how this distribution varies within each tenure type.

Figure 3: Land cover proportions within each tenure type



Māori Land Court land has 33% indigenous forest cover, and of all Treaty Settlement land, 27% is in indigenous forest cover. This compares to General land only having 8% indigenous forest cover. Māori Land Court Land and Treaty Settlement land each have approximately four times the proportion of indigenous forest cover as general land. Of all the public conservation land (which is legally protected), we can see that 82% is covered in some type of indigenous vegetation (other cover such as riverbeds or rocky mountain tops are not included in this analysis which may also have biodiversity values).

What this land cover analysis doesn't distinguish, however, is whether the indigenous forest cover is precious or common.

Threatened Environment Classification, with land ownership type

Threatened Environment Classification looks across land environments and deduces a threat classification through assessing:

- how much native (indigenous) cover remains within each different land environment
- how much land is legally protected (for the purpose of protecting natural heritage) within each land environment, and
- how these environments, with different levels of indigenous cover and natural heritage protection, are distributed across New Zealand's landscape

For example, we know that conservation land has a lot of forest that is legally protected (so low threat status). Conversely, some other environments that aren't in conservation land are much rarer, have significantly less indigenous vegetation than previously, and are not legally protected, making them more threatened.

See Appendices 4 and 5 for the tables of data referred to in this section (Appendix 4: Distribution of threatened indigenous cover by tenure type (area, in hectares), and Appendix 5: Normalised for total area of each tenure type).

Indigenous forest

Tables in appendix 5 shows that there isn't much difference between the proportion of General land and the proportion of Māori Land Court Land that has **indigenous forest cover** with less than 10% cover left (both at 0.5%). However, this is more than double the proportion of indigenous forest cover with less than 10% remaining in the other land ownership categories. This means that the General land and Māori Land Court land have a higher representation of these precious forests when compared to other tenure types.

When considering the least threatened indigenous forest cover, that has more than 30% left and more than 20% protected, we can see that Public Conservation Land has 54% of this cover/ threat combination, and each type of Māori land (Māori Land Court and Treaty) has approximately 23%.

This shows that the greatest proportion of the most threatened indigenous forest environments are found on both General and Māori Land Court land, and that the greatest proportion of the more protected and 'less threatened' indigenous forest environments are found on DOC land and, to a lesser extent, Māori land (both Māori Land Court and Treaty Settlement land).

This suggests that further protection of the most threatened types of indigenous forests (i.e. less than 10% indigenous cover) would not inequitably disadvantage Māori landowners as compared to general land owners. However, Māori landowners would be inequitably disadvantaged if less threatened types of forest (i.e. where there is between 10-30% indigenous cover left) were also to have increased protection – which may be needed in order to prevent the less threatened types of forest becoming more threatened. It is also highly likely that protection will extent to these other threatened types of forest given that significance criteria for indigenous vegetation and habitats commonly assess these as significant natural areas when there is less than 20% or 30% of that vegetation or habitat remaining.

Appendix 6 (Distribution as a percent of each cover/threat combination) shows that **by area, of all the indigenous forest** that has less than 10% remaining, most (77%) is in general land. Of all the indigenous forest in the next three threat categories, nearly half of each of these threat levels is in general land. These are numbers we would expect, as the general land category is a large area, about half of New Zealand.

Indigenous scrub/shrubland

Tables in Appendix 5 show that when it comes to **indigenous scrub/shrubland** in environments that have less than 10% remaining, there is a four times greater proportion of this cover in general and Māori Land Court land than in other land ownership types.

When considering the distribution of threatened indigenous shrubland across New Zealand, Appendix 6 demonstrates that all of the three most threatened categories of indigenous scrub or shrubland, occur most is on general land (64-81% in each of the three categories).

Tussock grassland

Note that grasslands important for indigenous biodiversity are underestimated in this analysis, due to the challenge in assessing biodiversity values of mixed and exotic grassland classes in LCDB (see Appendix 1 for details). This underestimate is likely to be mostly in Crown Land and General Land.

For **tussock grassland**, 29% of Crown Land is in tussock grassland in environments that have more than 30% of cover remaining and more than 20% protected. This is significantly higher than any other land ownership category. For the most threatened tussock grassland (in environments that has less than 10% remaining), this makes up 0.1% of all of both Crown Land and General land.

However, if you look at the proportion of all tussock grassland (in Appendix 6), you can see that General land has 70% of the total area of tussock grassland in environments that have less than 10% cover left, and 73% of all tussock grassland in environments that have only 10-20% cover left. This means that protection of tussocks on General land is an important consideration.

Threatened Environment Classification and effects to avoid

Manaaki Whenua Landcare Research provided advice to the BCG titled “Critical factors to maintain biodiversity: what effects must be avoided, remediated or mitigated to halt biodiversity loss?” in February 2018. This advice listed a number of effects to avoid, and one of these was:

Avoid... temporary or permanent fragmentation, reduction in size, and/or degradation of the ecological integrity of... A1c indigenous vegetation in land environments with less than 20% indigenous cover remaining (pages 25-26 of the report)

The total area of indigenous cover in this type of land environment is 513,705 hectares (2% of New Zealand’s land area).

Ownership of this type of land environment is shown in the table below:

Areas of indigenous land cover in threatened environments with < 20% cover remaining (in hectares)

Area(ha)	Tenure type					Grand Total of land in each land cover type
	CROWN	DOC	GENERAL	MLC	TREATY	
Indigenous forest	4,053	71,563	157,604	30,689	8,985	272,894
Indigenous scrub/shrubland	3,701	23,420	152,295	31,473	5,342	216,230
Tussock grassland	3,086	3,525	17,505	434	31	24,581
Grand Total of land in each tenure type	10,839	98,508	327,405	62,596	14,358	513,705

Some of the most threatened environments are already managed or restricted from further development through existing council policies, objectives and rules. It would be difficult to say exactly how much, as this would require councils to map all SNAs in a consistent way, and then overlay this with the Threatened Environment Classification. Moreover, some of these threatened environments will be legally protected through QEII covenants and Ngā Whenua Rahui. This is out of

scope of this analysis, although note that the amount of legal protection nationally for a land environment is factored into its threat classification.

Discussion questions for the BCG to consider

1. What is the role of the Threatened Environment Classification in the NPSIB?
2. What is the role of other datasets/models for prioritising biodiversity?
3. As not all indigenous vegetation is equal, how should the NPSIB or councils prioritise some over other?
4. Given the disproportionate amount of indigenous cover on Māori land (both Māori Land Court and Treaty Settlement land), how should this be managed, even if it is not the most threatened biodiversity? For example, should there be tailored support for Māori landowners to keep/protect/actively manage biodiversity on their land? (e.g. Ngā Whenua Rāhui or more)? Should the NPSIB include policy direction to ensure Māori land is not disadvantaged?
5. How should the policy package provide for the above, while dealing with the differences between Māori Land Court land and Treaty Settlement land?
6. Given that the the largest area of threatened indigenous forest is on general private land (not Māori land), how should regulation and/or complementary measures or incentives for protecting indigenous forests best be targeted to these landowners?
7. Should the differences in land ownership type be taken into account for the management of indigenous scrub/shrubland, and for tussock grasslands?

Appendix 1: Methods for this analysis - Overview of the datasets, purpose and limitations

The analysis using Threatened Environment Classification has been done to provide a national level snapshot – this is indicative, not precise, but we feel this is sufficient detail and sufficiently accurate to inform the level of policy recommendations the BCG is making.

It is also important to note that the Treaty Settlement layer is newly developed and while best endeavours have been made to ensure it is accurate, it only includes settlements up to March 2017 and only land areas which included a fee simple transfer of ownership. It is possible that this land has since been sold and moved out of Māori ownership and into general land. However, it is still a useful indication of the threatened environments that are on Treaty Settlement land.

Grasslands and shrubland that are important for biodiversity are underestimated in this analysis, due to the difficulty in identifying all areas of indigenous cover mixed in with exotic cover is some LCDB grassland and shrub classes. This analysis focuses on indigenous vegetation classes. In reviewing the methodology and data behind this analysis, Manaaki Whenua noted that the underestimates of the threatened environment native cover will be notable in Crown and General land in the South Island, due to the exclusion of the depleted grassland, low producing grassland and mixed exotic shrubland classes. These classes, while mixed exotic and indigenous vegetation, are often incredibly high value for maintaining indigenous biodiversity, and often support some of the biota that is most vulnerable to loss. In summary, complete indigenousness of vegetation does not equate to value or importance for biodiversity.

If the BCG wish to investigate these classes further, advice could be sought from Manaaki Whenua on comparing the results of this analysis with those from a rerun of the process including the portion of the mixed classes (low producing grassland, depleted grassland, and mixed exotic shrubland,) that fall within the dryland zone (>270 mm annual penman moisture deficit).

Appendix 2: Summary of datasets and classification systems

This information is drawn from websites, presentations and information from Manaaki Whenua Landcare Research, MFE and DOC. For each dataset/model/classification system, we have listed what it covers (purpose and key features), custodian (who owns/manages it), limitations/risks, linkages with other systems, and links for further information.

New Zealand Land Cover Database (LCDB)

What it covers	<ul style="list-style-type: none">• The LCDB is a digital map of New Zealand’s land surface. The Land Cover Database identifies land cover (what is growing on the ground or what feature covers the ground).• It is created by grouping together similar classes which can be identified in satellite images. As a map, it can be combined with other geographic information to reveal new information on patterns and trends of land use and land cover.• It contains snapshots of land cover over several dates. Currently it maps out land cover at the dates 1996/7, 2001/2, 2008/9, and 2012/13• At each date land cover is classified into one of 33 classes
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	<ul style="list-style-type: none"> • Land cover is described for over 500,000 polygons as small as 1ha in size • All terrestrial land (including inter-tidal mangrove communities) is mapped except the Kermadec and sub-Antarctic islands. • Can show how trends in vegetation cover have changed over time (e.g. in regions or hotspots)
Custodian	Manaaki Whenua Landcare Research
Limitations/Risks	<ul style="list-style-type: none"> • Updated every 4-6 years, dependent on funding, no long-term funding. • Information may be out of date by the time it is used (e.g. land use may have changed). • Some issues with resolution (level of detail) and classification accuracy (e.g. manuka and gorse/broom can look very similar in satellite imagery) • Coarse level data, doesn't pick up on incremental change, small areas, or level of ecosystem functioning. Grassland areas more prone to inaccuracies due to subtleties not picked up by satellite imagery. • LCDB does not necessarily capture biodiversity values (e.g. indigenous fauna in exotic vegetation), so cannot be solely used as indicating presences of biodiversity
Linkages with other data	It is a foundation dataset used in many other different datasets (including Threatened Environment Classification).
Links	Current version is LCDB v4.1 available from https://Iris.scinfo.org.nz/layer/48423-lcdb-v41-land-cover-database-version-41-mainland-new-zealand/

Land Environments of New Zealand (LENZ)

What it covers	<p>The Land Environments of New Zealand (LENZ) classification maps areas of the New Zealand landscape that have a similar environmental character. It is used to identify areas that are similar, regardless of where they occur (that is, areas which are not necessarily the same in all respects, but are likely to contain similar species, and have similar biological interactions and processes).</p> <p>Two of the main features are:</p> <ul style="list-style-type: none"> • It uses 15 climate, landform and soil factors that are considered likely to influence the distribution of animal or plant species. Based on these factors, land environments can be used as a surrogate for ecosystems. • It can be used at four levels of detail to map 20, 100, 200, or 500 land environments. The higher levels provide greater detail by showing more land environments. The level of 20 land environments is used to report on biodiversity indicators.
Custodian	LENZ has been produced by MfE in partnership with Manaaki Whenua Landcare Research New Zealand
Limitations/Risks	LENZ classifies environments, but the differences between environments are likely to be more gradual or continuous. Land environments are capable of supporting multiple ecosystems but this is out of scope of LENZ.
Linkages with other data	Used in the Threatened Environments Classification, as “a surrogate for the potential ‘full range’ of terrestrial ecosystems and species habitats once found across NZ” (see Threatened Enviro user guide 2015).
Links	<ul style="list-style-type: none"> • Download the LENZ classification layers from the MfE Data Service.

This document does not represent Government or Ministry policy and is provided as a 'platform of information' to facilitate discussion and support the Biodiversity Collaborative Group. [Date: 12 July 2018]

	<ul style="list-style-type: none"> • The underlying layers are available from Manaaki Whenua Landcare Research's LENZ page. • The full colour atlas is available from bookstores (published by David Bateman Ltd, ISBN 1-86953-522-7).
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Protected Areas Network – New Zealand (PANNZ)

What it covers	A spatial database of private and public land legally protected primarily for conservation or preservation of intrinsic natural value. It includes all public conservation lands and covenants administered for the purposes of natural heritage protection by the Department of Conservation, Queen Elizabeth II National Trust, Ngā Whenua Rahui, as well as some regional parks (from Auckland, Bay of Plenty, Horizons and Greater Wellington).
Custodian	Manaaki Whenua Landcare Research unofficially maintains and periodically updates the PANNZ database.
Limitations/Risks	<ul style="list-style-type: none"> • May include Crown land managed by DOC for purposes other than conservation (such as racecourse, cemeteries, marginal strips) which can increase estimates of protected land. • May underestimate protected indigenous vegetation in some districts as various types of privately protected land are not digitised or included in the dataset of any agency. • PANNZ was last updated in 2012. Subsequent changes to public conservation land, QEII covenants or Nga Whenua Rahui will not be reflected in PANNZ, or the Threatened Environments Classification.
Linkages with other data	This dataset is the protection dataset used for the Threatened Environment Classification.
Links	More information is here: https://www.landcareresearch.co.nz/resources/maps-satellites/pannz

Threatened Environment Classification 2012 (LENZ + LCDB + PANNZ)

What it covers	<p>The Threatened Environment Classification is a combination of three national databases: Land Environments New Zealand (LENZ), Land Cover Database (LCDB) and the Protected Areas Network New Zealand (PANNZ) (reflecting areas legally protected for the purpose of natural heritage protection). PANNZ is used as legally protected areas are less likely to be cleared, and most likely to receive investment for conservation management. The classification combines this information into a simple and practical GIS tool.</p> <p>Specifically, the Classification indicates:</p> <ul style="list-style-type: none"> • how much native (indigenous) cover remains within each land environment • how much land is legally protected (for the purpose of protecting natural heritage) within each land environment, and • how these environments, with specified levels of indigenous cover and protection, are distributed across New Zealand's landscape. <p>It divides New Zealand into six threat categories:</p> <ul style="list-style-type: none"> • <10% indigenous cover left (Acutely threatened) • 10–20% indigenous cover left (Chronically threatened)
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	<ul style="list-style-type: none"> • 20–30% indigenous cover left (At risk) • >30% left and <10% protected (Critically underprotected) • >30% left and 10–20% protected (Underprotected) • >30% left and >20% protected (Less reduced and better protected) <p>The classification provides national-scale information on loss and protection in a way that is consistent across New Zealand because it treats all areas on the same basis. It’s objective, in that it is based on data rather than opinion. It is therefore part of a biodiversity protection toolkit that can complement local surveys and other information.</p> <p>The classification supports the prioritisation of environments. It does not claim to provide what acceptable levels of loss or protection are, or what is needed to halt decline into the future, but simply prioritises the current threat levels.</p> <p>Only terrestrial ecosystems. Excludes rivers, lakes and marine ecosystems.</p>
Custodian	Manaaki Whenua Landcare Research
Limitations/Risks	<p>The classification provides national context but cannot substitute for on-the-ground assessment of the indigenous biodiversity that is actually there. It is based on national datasets that have limitations at local and property scales.</p> <p>Underlying data:</p> <ul style="list-style-type: none"> • Not a fine scale tool: Relies on LCDB which is coarse data (see LCDB limitations). For Threatened Environment Classification, LCDB classes are divided between ‘exotic’ and ‘indigenous’ which is a somewhat oversimplified split. This creates some uncertainties overall. • PANNZ: Was last updated in 2012, so does not reflect more recent changes to protected areas. It also does not include all protected areas (such as council-protected areas that are not ‘for purposes of conservation’ but may be primarily for biodiversity reasons, or land owned and protected through trusts/organisations but not covenanted). Therefore, it does not replace the need for ecological mapping in regions and districts. <p>Overarching limitations:</p> <ul style="list-style-type: none"> • Cannot be used for locating threatened species (in some areas there is a strong correlation but not in other areas). • Is not appropriate for prioritising weed and pest control, as some indigenous habitats that have remained safe from human pressures and may be a higher priority for pest/weed control than the environments shown to be at threat in the classification.
Linkages with other data	Combination of three national databases: Land Environments New Zealand 2003 (LENZ), classes Land Cover Database (LCDB) version 4.0 and the Protected Areas Network New Zealand (PANNZ).
Key findings	<ul style="list-style-type: none"> • There are no threatened environments that are steep, high, cold, wet, and that have reliable rainfall • Flatness, lowness and dryness with rainfall variability are represented only in threatened environments

	This classification is important as the area of habitat has a non-linear relationship to the number of species within it. As more habitat is lost, species are also lost at increasing rates.
Links	<ul style="list-style-type: none"> • See the 2015 User Guide for overview and key findings. https://www.landcareresearch.co.nz/resources/maps-satellites/threatened-environment-classification • GIS layer can be downloaded http://Iris.scinfo.org.nz • See also: Cieraad E, Walker S, Price R and Barringer J, 2015. An updated assessment of indigenous cover remaining and legal protection in New Zealand's land environments New Zealand Journal of Ecology (2015) 39:2 http://newzealandecology.org/nzje/3235.pdf

Naturally uncommon ecosystems

Note: Naturally uncommon ecosystems were not used in the analysis in the paper above, but is another classification that warrants consideration for prioritising biodiversity.

What it covers	<p>Natural uncommon ecosystems are those that were rare before human colonisation of New Zealand and have a total extent less than 0.5% of New Zealand's total area. To date, 71 types of naturally uncommon ecosystems have been identified as occurring in New Zealand (earlier figures have grouped ecosystems differently, resulting in different counts). 34 of these ecosystems have been mapped.</p> <p>New Zealand's naturally uncommon (also referred to as "naturally" or "historically" "rare") ecosystems represent unusual/extreme environments and are often hotspots for biodiversity. Rare and naturally uncommon ecosystems have been widely recognised as priority areas for conservation protection.</p> <p>They contain half of New Zealand's nationally threatened plant species. In addition, 38 percent of the 160 nationally threatened Lepidoptera family (butterflies and moths) live in ecosystems that are themselves limited in distribution nationally (Williams et al, 2007). Almost two-thirds (45) of New Zealand's 71 identified rare and naturally uncommon ecosystems are classified as threatened under the International Union for Conservation of Nature (IUCN, 2017) Red List criteria, based on changes in extent of ecosystems and reductions in ecosystem processes. Of these, 18 (40 percent) are critically endangered, which means they are at the greatest risk of degradation or loss.</p>
Custodian	Manaaki Whenua Landcare Research and DOC
Limitations/Risks	Rare and Naturally uncommon ecosystems are not a finite list, and more will be added to this list as further research identifies these ecosystems.
Linkages with other data	Research was done in 2011 by Manaaki Whenua Landcare Research for MFE on the relationship between naturally uncommon ecosystems and LENZ Threatened Environments. They used map layers available for some of the naturally uncommon ecosystems, to determine the level of overlap, and for the naturally uncommon ecosystems without map layers, they applied expert judgement to determine the overlap. Overlap between the naturally uncommon ecosystems and LENZ threatened environments ranged from nil to

	95–100%. This demonstrates the need for multiple datasets needed for prioritisation of biodiversity for protection and management.
Links	Rare and naturally uncommon ecosystems were in the <i>Our Land</i> report in 2018: http://www.mfe.govt.nz/node/21294 The detail behind this part of the report is here: http://archive.stats.govt.nz/browse_for_stats/environment/environmental-reporting-series/environmental-indicators/Home/Land/rare-ecosystems.aspx

Singers and Rogers: Potential ecosystems/vegetation of New Zealand

Note: Singers and Rogers classification was not used in the analysis in the paper above, but is another classification that warrants consideration for the management and prioritisation of biodiversity.

What it covers	<p>The Singers and Rogers classification categorises and maps the potential terrestrial ecosystem types and potential vegetation cover.</p> <p>The classification aims to integrate physical variables (such as those classified in LENZ), environmental functional and process variables (such as flooding and sedimentation) and biotic composition. The classification assists in identifying the relationship between ecosystem patterns and process, existing natural vegetation and modified landscapes.</p> <p>DOC and regional councils use Singers and Rogers classifications and maps to compare the remaining extent of ecosystems with the potential ecosystem types, to prioritise ecosystems for management and protection purposes.</p>
Custodian	Singers and Rogers, who undertake the work as commissioned by councils.
Limitations/Risks	The classification has not yet been completed for the whole country. As per Nicholas Singers presentation to the Biodiversity Collaborative Group in November 2017, there are six regions with completed data, two regional councils with mapping underway, and two regional councils with mapping planned.
Linkages with other data	Draws on a range of data and classifications for the environmental and biotic variables, including LENZ (and the data beneath it), climatic zone maps, and a range of ecologists published work on the natural ranges of various plant species and forest types.
Links	<p>Singers, N. and Rogers, G. (2014). <i>A classification of New Zealand's terrestrial ecosystems</i>. Science for Conservation 325. Department of Conservation, Wellington.</p> <p>https://www.doc.govt.nz/Documents/science-and-technical/sfc325entire.pdf</p> <p>See also the presentation by Nicholas Singers and meeting notes from 30 November 2017 meeting of the Biodiversity Collaborative Group.</p>