

# Assessing limits to offsets— supporting data available in New Zealand

A range of datasets and databases are available in New Zealand that can support an assessment of limits to offsetting. These data sources help to identify biodiversity features that are irreplaceable or vulnerable and, when combined with an assessment of offsetability, can provide information about the risks and likelihood that an offset can be achieved.

## 1. International importance

### 1.1 Ramsar Convention

The Convention on Wetlands of International Importance (Ramsar, Iran, 1971)—known as the ‘Ramsar Convention’—is an intergovernmental treaty that embodies the commitments of its member countries to maintain the ecological character of their Wetlands of International Importance and to plan for the ‘wise use’, or sustainable use, of all of the wetlands in their territories. Unlike the other global environmental conventions, Ramsar is not affiliated with the United Nations system of Multilateral Environmental Agreements (MEAs), but it works very closely with the other MEAs and is a full partner among the ‘biodiversity-related cluster’ of treaties and agreements.

#### Sources of information

- The location of all approved RAMSAR sites is available to download from the web as a KML file which is opened with Google Earth. Save it to your computer and double click to open in Google Earth.  
<http://ramsar.wetlands.org/GISMaps/RamsarSitesinGoogleEarth/tabid/944/language/en-US/Default.aspx>
- <http://gis.doc.govt.nz/docgis/>—Department of Conservation (DOC) website with GIS layers of conservation areas, ecological districts and regions, DOC conservancies, and LandCover DataBase (LCBD) on topographical maps.
- Information about sites that are nominated to become RAMSAR sites can be obtained from the local DOC office.

#### Strengths and cautions

- Recognised by international conventions.
- Additional sites can be added or nominated, talk to the local DOC office for the region of interest.

### 1.2 World Heritage Area

Heritage is our legacy from the past, what we live with today, and what we pass on to future generations. Our cultural and natural heritage is an irreplaceable source of life and inspiration. The United Nations Educational, Scientific and Cultural Organization (UNESCO) seeks to encourage the identification, protection, and preservation of cultural and natural heritage around the world that is considered to be of outstanding value to humanity. This is embodied in an international treaty called the [Convention concerning the Protection of the World Cultural and Natural Heritage](#) (<http://whc.unesco.org/?cid=175>), adopted by UNESCO in 1972.

### Sources of information

- <http://whc.unesco.org/en/list>
- <http://gis.doc.govt.nz/docgis/>
- Listed as of 16 March 2012 were
  - a) [New Zealand Sub-Antarctic Islands](http://whc.unesco.org/en/list/877) (<http://whc.unesco.org/en/list/877>)
  - b) [Te Wahipounamu – South West New Zealand](http://whc.unesco.org/en/list/551) (<http://whc.unesco.org/en/list/551>)
  - c) [Tongariro National Park](http://whc.unesco.org/en/list/421) (<http://whc.unesco.org/en/list/421>)

### Strengths and cautions

- Recognised by international conventions.
- Additional sites can be added or nominated, talk to the local Department of Conservation office for the region of interest.

## 2. National importance

### 2.1 Recommended for protection on private land

Much of our rare and threatened native biodiversity is found on private land. In fact, some species are now only found on private land. The national priorities for protection of biodiversity on private land identify the types of ecosystems and habitats most in need of protection (Ministry for the Environment 2007) <sup>1</sup>:

- **National Priority 1:** To protect indigenous vegetation associated with land environments, (defined by Land Environments of New Zealand at Level IV), that have 20% or less remaining in indigenous cover.
- **National Priority 2:** To protect indigenous vegetation associated with sand dunes and wetlands; ecosystem types that have become uncommon due to human activity.
- **National Priority 3:** To protect indigenous vegetation associated with 'originally rare' terrestrial ecosystem types not already covered by priorities 1 and 2.
- **National Priority 4:** To protect habitats of Acutely Threatened and Chronically Threatened indigenous species<sup>2</sup>.

### Sources of information

- <http://www.biodiversity.govt.nz/pdfs/protecting-our-places-detail.pdf>
- <http://www.biodiversity.govt.nz/pdfs/protecting-our-places-brochure.pdf>
- <http://www.mfe.govt.nz/issues/biodiversity/initiatives/private-land/work-programme.html>

### Strengths and cautions

- Generally accepted within New Zealand.
- Ranking depends on the quality and intactness of the habitat and vegetation types.

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<sup>1</sup> <http://www.biodiversity.govt.nz/pdfs/protecting-our-places-brochure.pdf>

<sup>2</sup> The threat classification system on which this priority is based (Molloy et al. 2002) is now outdated. Applicable threat classifications from the latest system (Townsend et al. 2008) are Threatened and At Risk. See <http://www.doc.govt.nz/publications/conservation/nz-threat-classification-system/nz-threat-classification-system-manual-2008/>

## **2.2 Proposed National Biodiversity Policy Statement**

The proposed National Policy Statement (NPS) on Indigenous Biodiversity is intended to provide clearer direction to local authorities on their responsibilities for managing indigenous biodiversity under the Resource Management Act 1991. It outlines policies and decision-making frameworks for the identification and management of indigenous biodiversity found outside the public conservation estate.

The proposed NPS on Indigenous Biodiversity contains a list of criteria for identifying areas of indigenous vegetation and habitats of indigenous animals that have been recognised as being rare and/or threatened at a national level. These criteria are based on the Government’s Statement of National Priorities for Protecting Rare and Threatened Biodiversity on Private Land.

The proposed NPS on Indigenous Biodiversity is not operative as at April 2013, and there is no clear schedule for its approval, amendment or withdrawal. However, if it were made operative in its current form it would require district and regional plans to identify these areas of significant biodiversity within 5 years of the NPS on Indigenous Biodiversity taking effect. Its current content also provides an indication of the level of information and application of no net loss offsetting that could be applied in future as part of a regulated offset system in New Zealand.

### **Sources of information**

- <http://www.mfe.govt.nz/publications/biodiversity/indigenous-biodiversity/index.html>

## **2.3 Natural Heritage management System (NHMS) site ranking**

This uses a spatial prioritisation tool (Zonation) to rank a set of pre-selected management units according to their contribution to the management of a full range of New Zealand’s ecosystems. In calculating rankings, it also exploits potential synergies with species-focused work and endeavours to protect current gains made through recent management. It is currently implemented using a set of 940 management units, most of which contain sequences of related ecosystems. Department of Conservation operations staff have developed fully-costed management prescriptions for 750 of these; the remainder, many of which contain private land, have been excluded from the ranking procedure at this stage.

### **Sources of information**

- Contact the Department of Conservation

### **Strengths and cautions**

- Provides an objective ranking of ecosystem management projects across New Zealand’s public conservation lands.
- Ecosystem classification information provides an approximate framework for assessing like with like.
- Spatial information about the distributions of ecosystems is incomplete, providing coverage only within management units, and not in the remaining two-thirds of Public Conservation Land or that falls outside of these units or on private land.
- Relationships or similarities between terrestrial ecosystems are only described in a qualitative sense, and the classification varies widely in the level of discrimination it provides.
- Does not yet include an estimate of what, or how many, Threatened, At Risk, or iconic species occur in each management unit.

## 2.4 Vital Sites

This approach uses ecological integrity to guide and evaluate offset design. Lee *et al.* (2005)<sup>3</sup> defined three elements of ecological integrity:

- **Species occupancy**—the extent to which species fill their natural ranges.
- **Environmental representation**—the entire range of ecosystems are represented.
- **Native dominance**—species composition and ecosystems processes are dominated by native species.

Impacts and offsets can be evaluated on a common basis relative to ecological integrity criteria, and the data in the mathematical model can be used for offset design and evaluation, including:

- Providing an initial assessment of impacts from digital information;
- Providing computational machinery to assess ecological integrity and significance;
- Providing ecological context for sites and impacts; and,
- Estimating loss rates in other areas and opportunities for offsets by estimating offset density maps that include time discounting.

### Sources of information

- Jake Overton Landcare Research

### Strengths and cautions

- Could help quantify the amount of offset required.
- Could be good for initial scoping of whether biodiversity offsetting is possible, without detailed site visits.
- Assumes areas that are legally protected cannot be further enhanced. This is not necessarily correct.
- Not all legally protected areas are correctly identified.
- Data is currently limited; not available for all species (or even all threatened species); misses some ecosystem types; difficult to determine the dominance of indigenous species at each site.
- Currently cannot use quantitative data collected at a site (i.e. measured) to modify the model, but can check the model against those data.
- New method that needs further assessment and development.
- Preferably should not be used to compare the significance of common species with threatened species, as threatened species have a higher per capita significance.
- May currently not be suitable for short payback (i.e. short time to achieving no net loss) or high estimated loss rates.

## 2.5 Reserve status and protected areas

Several different legislative Acts work together to protect natural values and biodiversity. If the values that are being protected by a particular reserve type are adversely affected by the development, and cannot be adequately avoided, remedied

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<sup>3</sup> Lee, W.; McGlone, M.; Wright, E. 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. Landcare Research Contract Report: LC0405/122.

or mitigated, then development may not be approved for those areas. The following land management types (and their management agencies) have been legally protected for natural or biodiversity values:

### **Public Conservation Land (managed by the Department of Conservation)**

The concessions regime (Conservation Act 1987) governs the majority of activities that can take place on public conservation land (other than those activities governed by the Crown Minerals Act 1991—access arrangements (excluding Schedule 4 “Land that may be protected area” of the Conservation Act (CA)). The CA sets out certain tests that the concession application must meet before it may be granted. In particular, the Minister must decline an application if he or she considers that it does not comply with, or is inconsistent with, the provisions of the CA or any relevant conservation management planning document. The minister may decline an activity that is contrary to the purpose for which the land is held, and is intended to be managed, for the purposes of conservation. Contact Department of Conservation.

### **QEII Open Space Covenant**

Queen Elizabeth II National Trust helps private landowners in New Zealand protect significant natural and cultural features on their land through open space covenants. These covenants help safeguard forever special features such as landscapes, forest remnants, wetlands, lakes, threatened species habitats, geological features and cultural heritage sites. Covenants are created under the Queen Elizabeth the Second National Trust Act 1977, and are difficult to uplift once created. However, upon application to the Board of Trustees, modifications can be granted to the boundaries of a covenant *provided this does not materially impinge on the values protected by the covenant*. Thus, as with Public Conservation Land, biodiversity offsetting may not therefore be considered a natural fit with addressing adverse effects under the concessions regime. Contact <http://openspace.org.nz/>

### **Nga Whenua Rahui kawenata**

Maori landowners can protect their indigenous ecosystems under Nga Whenua Rahui kawenata. The agreement is sensitive to Maori values in terms of spirituality and tikanga. Cultural use of these natural areas is blended with the acceptance of public access within the agreements. The objective is long-term protection with inter-generational reviews of conditions. The criteria and mechanisms of Nga Whenua Rahui, are geared towards the owners retaining tino rangatiratanga (ownership and control). The principal mechanisms used are Nga Whenua Rahui kawenata pursuant to section 77A Reserves Act 1977 and an Agreement for the Management of Land pursuant to section 29 Conservation Act. Some of the smaller blocks have opted for formal protection pursuant to section 338 of Te Ture Whenua Act 1993. This involves the setting aside of areas as Maori reservations.

Once the blocks are legally protected, the agreement is noted in the Maori Land Court. Discussions will need to be held with the guardians of the land as to whether the development proposed will have significant adverse effects on the values protected by the kawenata. Contact <http://www.doc.govt.nz/getting-involved/volunteer-join-or-start-a-project/start-or-fund-a-project/funding-for-landowners/nga-whenua-rahui/nga-whenua-rahui-fund/>.

### **Regional and District Parks and Reserves**

Many parks administered by a Regional Council or District Council fall under the Local Government Act 2002 (LGA 2002)<sup>4</sup> and are also held as reserves under the

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<sup>4</sup> And other acts that may apply to parks managed by regional councils e.g. the Wellington Regional Water Board Act 1972.

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Reserves Act 1977. If the Reserves Act applies then the reserve requires a management plan. The purposes of these plans are to:

*... provide for and ensure the use, enjoyment, maintenance, protection, and preservation, as the case may require, and, to the extent that the administering body's resources permit, the development, as appropriate, of the reserve for the purpose for which it is classified, and shall incorporate and ensure compliance with the principles set out in ... this Act for a reserve of that classification [Section 41(3) Reserves Act].*

This means that if the values that the reserve is protecting are adversely affected, then the development is unlikely to be considered appropriate. Regional councils with regional parks include Auckland, Bay of Plenty, Wellington, and Horizons Manawatu. Many district councils also manage reserves under a variety of legislation.

### Sources of information

- <http://gis.doc.govt.nz/docgis/>—DOC website with all relevant reserve information.
- <http://koordinates.com/layer/754-doc-public-conservation-areas/>—Publically available DOC GIS layer
- [http://www.openspace.org.nz/tools/email.aspx?SECT=Contact\\_us](http://www.openspace.org.nz/tools/email.aspx?SECT=Contact_us)—Contact QEII to request access to their GIS layer
- Nga Whenua Rahui kawenata—A GIS layer can be obtained from the Department of Conservation on request.
- Protected Areas Network—New Zealand (PAN-NZ) Database <http://www.landcareresearch.co.nz/databases/pannz/> contains information on protected areas for the three main islands of New Zealand (North, South, and Stewart) and all the inshore islands, including Crown Conservation Estate (managed by the Department of Conservation), regional parks, covenants, Nature Heritage Fund acquisitions, Nga Whenua Rahui, and Queen Elizabeth II National Trust covenants

### Strengths and cautions

- National network of recognised sites.
- GIS layers readily available to identify sites.
- New covenants are approved and registered each year. Therefore, it is important to ensure data layers and information is current (relates to QEII covenants, Nga Whenua Rahui kawenata and, possibly, covenants under the Conservation or Reserves Acts).
- Treaty claims in some areas means that some Public Conservation Land (i.e. managed by the Department of Conservation) may change or has changed status.

## 3. National, regional or local importance

### 3.1 Recommended areas for protection

New Zealand's physical environment is extremely diverse and this diversity is reflected in the range of indigenous plant and animal communities (ecosystems) present. The concept of dividing New Zealand into a series of *ecological regions and ecological districts* evolved because of the need for the establishment of a representative system of reserves which would encompass this ecological diversity. Each ecological district is characterised by its own distinctive pattern of geology, topography, climate, vegetation, ecosystems and other features. Surveys for high-

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value or representative ecological sites are often confined to specific ecological regions or ecological districts. The Protected Natural Areas Programme (PNAP) surveys are an example of this.

### **Recommended Areas for Protection (RAP)**

In Protected Natural Areas Programme (PNAP) surveys, Recommended Areas for Protection (RAPs) were the best remaining unprotected examples of particular habitat types in the ecological district. Therefore, RAPs have high priority for protection of representative ecological values.

### **Sites of Special Biological Interest (SSBI) and/or Areas of Biological Interest (ABI)**

Some PNAP reports also include or identify Sites of Special Biological Interest (SSBI) and/or Areas of Biological Interest (ABI). These databases are held by DOC, with data from earlier surveys often held on a card system. Inclusion of SSBI or ABI sites in PNAP reports is not consistent and it is worth consulting with staff at local DOC offices to ensure that these are not present at the development site.

### **Regional Council and/or District Council**

Some regional or district councils have undertaken surveys to identify sites of high or representative ecological value within part, or all, of the region they manage. These may be called Significant Natural Area (SNA), High Value Area (HVA), or Areas of Significant Conservation Value (ASCV) surveys. Some district and/or regional plans may have specific rules regarding Recommended Areas for Protection, significant areas, or particular types of vegetation or habitats.

### **Sources of information:**

The list of sources of information below is not exhaustive, and a literature search and/or web search may turn up additional information for a specific site.

- Descriptions of each ecological district (note there have been some changes to ecological district boundaries since these reports were published).  
<http://www.doc.govt.nz/upload/documents/science-and-technical/Ecoregions1.pdf>  
<http://www.doc.govt.nz/upload/documents/science-and-technical/Ecoregions2.pdf>  
<http://www.doc.govt.nz/upload/documents/science-and-technical/Ecoregions3.pdf>  
<http://www.doc.govt.nz/upload/documents/science-and-technical/Ecoregions4.pdf>
- Or refer to local DOC or Council offices to view a copy of the relevant PNAP or Significant Natural Areas report.
- There are other reports that outline the significance of different types of sites without detailing what is contained within the sites (i.e. they don't list species or habitat types). These types of reports can often be found by a web-based search for the ecological district name, or the name of the relevant territorial council.

### **Strengths and cautions**

- Most sites will have been assessed on the ground. This increases the accuracy of the site description and site values (however, not all values may have been identified, and values may have changed if the survey was undertaken some time ago).
- PNAP assessments are still being undertaken, or updated, so information for some areas is current.
- Generally provide good lists of ecosystem types and species at the site.
- Not all ecological districts have been surveyed.

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- Some ecological districts were surveyed a long time ago and the boundaries of mapped areas could have changed through clearance or vegetation becoming more mature.
- Sites not listed in a PNAP-type report may have been inadvertently missed and these may contain significant biodiversity values.

### **3.2 *Threatened, rare, or unusual species***

Are there any threatened, rare, or unusual species at the site? Is it a key habitat for these species? Will the development impact on these species, including cumulative impacts and loss of connection between sites? The best way to answer these questions is to talk to DOC staff about the species that may be present at the site, and whether this is considered to be a key site for the species.

#### **Sources of information**

- DOC threat classification lists.
- DOC Bioweb database (lizards, threatened plants)—contact DOC
- Conservancy species priority lists—contact DOC.
- Talk to DOC staff about species that may be present at the site, and whether this is considered to be a key site for the species.
- Robertson C.J.R.; Hyvonen P.; Fraser M.J.; Pickard C.R. 2007: Atlas of Bird Distribution in New Zealand 1999–2004. Wellington, Ornithological Society of New Zealand. 533 pp. Some information is also available electronically—contact Ornithological Society of New Zealand for type of information and associated costs.
- Plant species lists on New Zealand Plant Conservation Network.

#### **Strengths and cautions**

- Nationally-adopted threat classification system.
- Classifications undertaken by experts on particular groups of species.
- Not all parts of the country have been visited by people knowledgeable about indigenous species, so there are gaps in knowledge.
- Surveys or site visits may have occurred many years (or sometimes decades) ago and the data may no longer be accurate.
- The lists are reviewed and updated at somewhat irregular intervals. The latest version of the relevant classification list should be used.
- More species and sub-species are discovered as more areas are surveyed and more genetic and species characterisation is done.

#### **Plant species lists and plant threat classifications**

The New Zealand Plant Conservation Network (NZPCN) website provides information about indigenous plant species and their conservation in New Zealand. It also includes information about some exotic plants. The main focus is the nationally threatened plants and plant communities that require conservation management for their continued survival. Nearly all threatened species have been photographed and provided with descriptions of habitat and growth form. Plant threat classifications are updated as new information become available.

The site also outlines ecosystem risk criteria for areas that are important for plants (important plant areas) and plant communities that can have many rare or unusual plant species (important plant communities). It is also possible to search for plant lists for particular sites (it may be helpful to use the nearest local feature or district as key



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words). Plant lists provide a record of the species recorded during a visit to a site. Lists may cover large areas or districts (such as NW Nelson) or may be specific to a forest remnant.

#### **Sources of information**

- <http://www.nzpcn.org.nz/>
- [http://www.nzpcn.org.nz/page.asp?ecosystems\\_important\\_plant\\_areas\\_identification](http://www.nzpcn.org.nz/page.asp?ecosystems_important_plant_areas_identification)
- [http://www.nzpcn.org.nz/page.asp?ecosystems\\_plant\\_communities](http://www.nzpcn.org.nz/page.asp?ecosystems_plant_communities)
- [http://www.nzpcn.org.nz/page.asp?ecosystems\\_find\\_a\\_plant\\_list](http://www.nzpcn.org.nz/page.asp?ecosystems_find_a_plant_list)

### **3.3 Threatened, rare or unusual features**

#### **Historically rare habitats**

In New Zealand, there is a diverse array of small, rare ecosystems or habitats that tend to occur in extreme, typically treeless, environments. *Historically rare ecosystems* (also known as originally rare or naturally rare ecosystems) were rare before humans arrived in New Zealand. A disproportionately large amount of New Zealand's rare indigenous biodiversity is found in ecosystems that were historically rare. Ecosystems such as ephemeral (occasionally wet) wetlands, bluffs, limestone systems, geothermal vents and coastal turfs, may collectively contain half of our nationally threatened plant species. Unfortunately, many of these historically rare ecosystems are poorly understood, as well as being small and vulnerable and often highly threatened.

#### **New Zealand Geopreservation Inventory**

This inventory catalogues important geological sites, lists the potential threats that could destroy these sites, and ranks the sites for importance. The aim of the inventory is to ensure the survival of the best representative examples of the broad diversity of New Zealand's geologic features, landforms, soil sites, and active physical processes, so that we can understand the unique geological history of New Zealand, development of its landforms, and evolution of its biota.

#### **Regional, City, or District Plans**

Some regional and district plans contain schedules of natural features that are considered valuable (e.g. proposed Horizons One Plan Schedule E (Manawatu-Wanganui Regional Council, Tararua District Council Operative District Plan Appendix 2). The plans contain rules about what may be done within these places of value and whether such activities are *prohibited* (not allowed), *non-complying* (need to seek a consent, usually through public notification, no guarantee that a consent will be granted), *discretionary* (need to seek a consent, may not be publically notified), *restricted discretionary* (consent required, consent authority can exercise discretion as to whether or not to grant consent, and to impose conditions, but only in respect of those matters over which discretion is restricted in the plan or in national environmental standards or other regulations), *controlled* (consent required, but cannot be refused) or *permitted* (no consent needed).

#### **Protected Natural Areas Programme**

Threatened, rare, or unusual features are often described in Protected Natural Area Programme reports. Refer to the relevant report (if one is available) and score as for Recommend Areas for Protection (see above).

#### **Sources of information**

- Originally rare ecosystems lists [http://www.nzes.org.nz/nzje/free\\_issues/NZJEcol31\\_2\\_119.pdf](http://www.nzes.org.nz/nzje/free_issues/NZJEcol31_2_119.pdf) and Holdaway,

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R.J.; Wiser, S.K.; Williams, P.A. 2012: Status Assessment of New Zealand's Naturally Uncommon Ecosystems. *Conservation Biology* 26: 619–629.

- New Zealand Geopreservation Inventory <http://www.geomarine.org.nz/NZGI/>
- Regional, city, or district plans. Refer to relevant Regional Plan or District Plan—many of these are now available electronically on the internet but, in some instances, the council building or library in the region of interest will need to be visited to view a hard copy.
- Protected Natural Areas Programme. Refer to Recommended Areas for Protection (see above).

### **Strengths and cautions**

- Originally rare ecosystems have been assessed on a nationwide basis.
- The value of an originally rare ecosystem can depend on the amount of indigenous dominance, but many of these ecosystem types are difficult or impossible under current knowledge to restore or recreate once modified or destroyed.
- The amount of indigenous dominance for originally rare ecosystems, indicated above in the scoring system, has not been scientifically tested.
- There is no national consistency as to how natural values are identified or included in regional, city, or district plans. If a site spans more than one of these territorial agencies, then different rules can apply to the same habitat in different parts of the site.
- Not all areas have been surveyed as part of the Protected Natural Areas Programme, and not all of the reports have identified threatened, rare, or unusual features.

### **3.4 Landscape value and fragmentation**

Landscape value and fragmentation considers the spatial configuration of the vegetation at the development site and in the surrounding landscape.

There are a range of spatial frameworks that can be used to assess ecological significance. For terrestrial environments, the first four items on the list below are most commonly used and include the entire country, or most of the country. The three aquatic frameworks also include the entire country.

Some of this information has been sourced from the Quality Planning website, <http://www.qualityplanning.org.nz/plan-topics/indigenous-biodiversity/ecological-assessment-2f.php>

The key spatial frameworks used in New Zealand are:

- Land Environments of New Zealand (LENZ)
- Threatened Environment Classification (TEC)
- Land Cover Database
- Land systems
- Ecodomains
- Freshwater Ecosystems of New Zealand
- River Environment Classification
- Marine Environment Classification

## Land Environments of New Zealand (LENZ)

<http://www.landcareresearch.co.nz/databases/lenz/>

Land Environments of New Zealand (LENZ) was developed by Landcare Research to provide a spatial framework for the assessment of terrestrial biodiversity. Units are defined by analysis of available quantitative data on various climatic and geological/soil parameters that affect the growth of plants, or these parameters were estimated from surrounding locations for which information was available. ‘Land environments’ are areas with similar climatic and geological/soil characteristics and they may be present in a number of non-contiguous locations. The assumption is that similar land environments will have, or have the potential to develop, similar biological communities. LENZ is scalable, with more environments being identified at finer levels of analysis.

## Threatened Environment Classification (TEC)

[http://www.landcareresearch.co.nz/databases/LENZ/downloads/TECUserGuideV1\\_1.pdf](http://www.landcareresearch.co.nz/databases/LENZ/downloads/TECUserGuideV1_1.pdf)

The Threatened Environment Classification is a source of information on New Zealand’s terrestrial environments. It shows how much indigenous vegetation remains within land environments (LENZ), how much is legally protected, and how past vegetation loss and legal protection are distributed across New Zealand’s landscape. This has been combined into a GIS tool that focuses attention on areas in which much indigenous vegetation has been cleared and/or small proportions are legally protected (Walker *et al.* 2007<sup>5</sup>; Walker *et al.* 2008<sup>6</sup>). Table 1 provides details of Threatened Environment Classifications.

Table 1: Threatened Environment Classification categories and descriptions.

Threatened Environment Classification	Classification description
Acutely Threatened	Less than 10% indigenous vegetation cover remaining
Chronically Threatened	10–20% indigenous vegetation cover remaining
At Risk	20–30% indigenous vegetation cover remaining
Critically Underprotected	More than 30% indigenous vegetation cover remaining but less than 10% legally protected
Underprotected	More than 30% indigenous vegetation cover remaining and more than 20% legally protected
Less Reduced and Better Protected	More than 30% indigenous vegetation cover remaining and 10–20% legally protected

## Land Cover Database

<http://www.mfe.govt.nz/issues/land/land-cover-dbase/>

<http://www.mfe.govt.nz/issues/land/land-cover-dbase/lcdb2-user-guide.pdf>

<http://www.mfe.govt.nz/issues/land/land-cover-dbase/>

<http://iris.scinfo.org.nz/layer/304-lcdb-v30-land-cover-database-version-3/>

The New Zealand Land Cover Database (LCDB) is a digital map of the vegetation cover of the country. It is created by grouping together similar vegetation classes which can be identified in satellite images. It can be combined with other geographic information to reveal patterns and trends in land use and land cover. LCDB v2.0

<sup>5</sup> Walker, S.; Brower, A.L.; Stephens, R.T.; William, G.L. 2009. Why bartering biodiversity fails. *Conservation Letters* 2: 149–157.

<sup>6</sup> Walker, S.; Price, R.; Rutledge, D. 2008. New Zealand’s remaining indigenous cover: recent changes and biodiversity protection needs. *Science for Conservation* 284. Department of Conservation, New Zealand. 82 p.

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contains snapshots of land cover at 1996–97 and 2001–02. It is a tool for better resource management decisions, the more effective use of natural resources, and improved environmental management. LCDB v3.0 was released in July 2012 and includes non-temporal edits to the summer 1996/97, summer 2001/02 time periods along with the new summer 2008/09 period.

### **Land systems**

Land systems are defined by expert opinion, using information on rock type, tectonics, climate, and biota. The concept was developed by Landcare Research and Lucas Associates. Land systems have been defined for several local authorities including Environment Bay of Plenty and Marlborough.

### **Ecodomains**

<http://www.gw.govt.nz/assets/council-publications/Ecodomains%20for%20the%20Wellington%20Region.pdf>

Ecodomains are a spatial framework developed for the Wellington Region. The boundaries are delineated manually using a variety of data sources addressing climate, soil type, rock type, and vegetation. Sixty-four ecodomains have been developed for the Wellington Region.

### **Freshwater Ecosystems of New Zealand**

<http://www.doc.govt.nz/conservation/land-and-freshwater/freshwater/freshwater-ecosystems-of-new-zealand/>

The Freshwater Ecosystems of New Zealand (FENZ) geo-database provides an independent, national representation of the biodiversity values and pressures on New Zealand’s rivers, lakes, and wetlands. FENZ consists of a large set of spatial data layers and supporting information gathered from a wide variety of sources. It can be used to objectively map and quantify various aspects of New Zealand’s freshwater systems, providing:

- Comprehensive descriptions of the physical environment and biological character.
- Classifications that group together rivers and streams, and lakes and wetlands having similar ecological character.
- Estimates of human pressures and impacts on biodiversity status.
- Rankings of biodiversity value that indicate a minimum set of sites that would provide representative protection of a full range of freshwater ecosystems while taking account of both human pressures and connectivity.

### **The River Environment Classification**

<http://www.mfe.govt.nz/environmental-reporting/about-environmental-reporting/classification-systems/fresh-water.html>

[http://www.data.govt.nz/search/SearchForm?Search=river&action\\_doCustomSearch=](http://www.data.govt.nz/search/SearchForm?Search=river&action_doCustomSearch=)

The River Environment Classification divides river systems into units based on similarities and differences in a range of physical variables. The underlying assumption is that the physical variables chosen (‘controlling variables’) determine the physical habitat and therefore the biota most likely to be found there. Available physical databases are used to classify river reaches using ‘rules’ developed by an expert panel.

## The Marine Environment Classification

<http://www.mfe.govt.nz/publications/ser/marine-environment-classification-jun05/html/>

Uses multi-variate clustering of several spatial data layers that describe the physical environment. The classification system has been developed at two scales:

- A broad-scale classification of the entire Exclusive Economic Zone (covering the area below the mean high water line (but not including estuaries) from approximately 25–58°S and 158°E to 172°W).
- At the regional scale for the Hauraki Gulf Region (encompasses waters below the mean high water line, excluding estuaries).

### Strengths and cautions

- Many of these spatial information sources comprise nationwide data sets.
- Many of these spatial information sources are commonly used by ecologists and familiar to many commissioners and Environment Court judges.
- Does not include how species move around the landscape, or how much territory certain species require for the population to remain viable. For example, an isolated and relatively degraded estuary could be an important stop-over point for migrating wading birds, and kiwi populations are unlikely to be viable in protected areas of less than 10 000 ha (Basse & McLennan 2003)<sup>7</sup>.
- LCDB2 does not have finer divisions for indigenous vegetation (e.g. can't distinguish more valuable podocarp forest from other types of forest), and the mapping often misses wetlands.
- TEC may not reflect the true vulnerability of an area because it combines loss of vegetation with the amount of land protected in that Land Environment. For example, kauri gum swamps are much reduced in area from their original extent, but because part of this habitat type is legally protected it may not qualify for the highest threat categories.
- The ecological value of an area of indigenous habitat or vegetation needs to reflect both the species found there and how much of this habitat or vegetation type remains in the landscape. This often requires expert judgement, but is not always mutually agreed between experts.
- Some classification systems are not based on nationwide data sets, and are only applicable to certain parts of the country.

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<sup>7</sup> Basse, B.; McLennan, J. 2003. Protected areas for kiwi in mainland forests of New Zealand: how large should they be? *New Zealand Journal of Ecology* 27(2): 95–105.