LAND RESOURCE INFORMATION SYSTEM SPATIAL DATA LAYERS

Data Dictionary

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# Introduction

The Land Resource Information System comprises several physical resource themes: Land Use capability, Lithology, Soil, etc. These themes are founded on the New Zealand Land Resource Inventory (NZLRI) a single spatial (polygon) layer with national coverage, supplemented with numerous soil survey layers of local coverage.

Together they make up the most comprehensive spatial archive of New Zealand’s physical resource information. The NZLRI was released as published maps in its first edition, but once the survey was digitised into ‘Geographic Information Systems’ (GIS) and integrated with other resource surveys (e.g., soil maps), and as successive regions were remapped, it has become, most importantly, a computer database.

Its application as a planning and research tool has long been realised, and the database is now accessible on the computer systems of most regional and district councils, universities and relevant government agencies and research institutes.

The data is stored and managed in a normalised database format, different from the label format that appears on the published maps and is described in this report. A second volume to this report, describing the normalised data format, is in preparation. The label format is the traditional form for delivery to users. From 2001, Landcare Research plans to have the normalised data format available for delivery to users.

While this report has structured its description of the Land Resource Information System according to themes, these themes do not mimic an underlying data structure, but provide a logic for description that reflects clusters of applications and/or data layers which users may wish to obtain separately.

# Land Use Capability

**Description:** Polygon layer delineating land areas classified according to their capability to sustain continuous production. Land Use Capability (LUC) is a hierarchical classification identifying: the land’s general versatility for productive use; the factor most limiting to production; and a general association of characteristics relevant to productive use (e.g., landform, soil, erosion potential, etc.). LUC classifications have been constructed for each NZLRI survey region. These individual classifications have been correlated to North and South island classifications to permit wide-area analyses.

**Origin:** Interpreted, for each predefined land unit delineated in the 1:63 360/1:50 000 scale New Zealand Land Resource Inventory survey, from reference to the inventory of physical factors mapped and from a knowledge of climate and the effects of past land use.

**Item name(s):**  legend, LUC, lcorr

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item definition(s):** | *Name* | *Item width* | *Output width* | *Type* | *Decimals* |
|  | legend | 2 | 2 | c | - |
|  | LUC | 9 | 9 | c | - |
|  | lcorr | 5 | 5 | c | - |

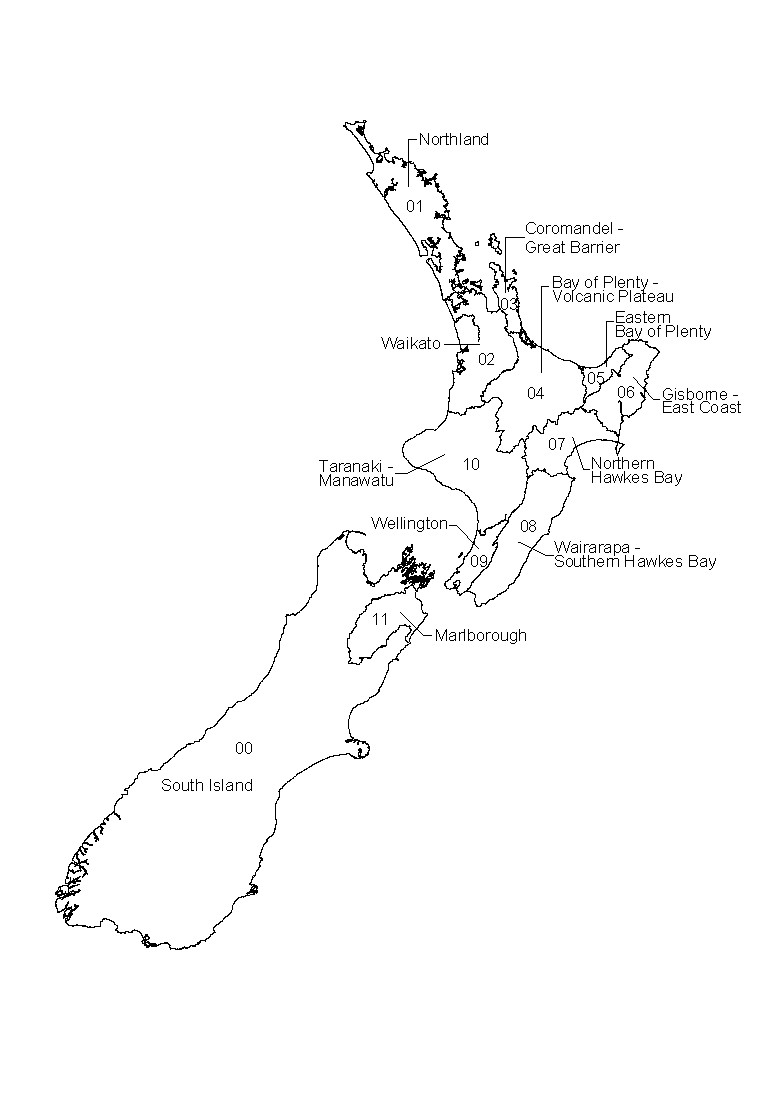
**Item values:** **1. legend**

|  |  |  |
| --- | --- | --- |
|  | *Legend code* | *Description* |
|  | 01 | Northland |
|  | 02 | Waikato |
|  | 03 | Coromandel–Great Barrier |
|  | 04 | Bay of Plenty–Volcanic Plateau |
|  | 05 | Eastern Bay of Plenty |
|  | 06 | Gisborne–East Coast |
|  | 07 | Northern Hawkes Bay |
|  | 08 | Wairarapa–Southern Hawke’s Bay |
|  | 09 | Wellington |
|  | 10 | Taranaki–Manawatu |
|  | 11 | Marlborough (2nd Edition) |
|  | 00 | South Island (other than Marlborough Ed2) |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**2. LUC** is an expression of three parts recorded in combination (see interpretation below):

Figure 1: New Zealand Land Resource Inventory survey regions (showing 'legend' numbers and Region name).



|  |  |  |
| --- | --- | --- |
|  | ***LUC Class code*** | ***Description*** |
|  | 1 | Land with virtually no limitations for arable use and suitable for cultivated crops, pasture or forestry |
|  | 2 | Land with slight limitations for arable use and suitable for cultivated crops, pasture or forestry |
|  | 3 | Land with moderate limitations for arable use, but suitable for cultivated crops, pasture or forestry |
|  | 4 | Land with moderate limitations for arable use, but suitable for occasional cropping, pasture or forestry |
|  | 5 | High producing land unsuitable for arable use, but only slight limitations for pastoral or forestry use |
|  | 6 | Non-arable land with moderate limitations for use under perennial vegetation such as pasture or forest |
|  | 7 | Non-arable land with severe limitations to use under perennial vegetation such as pasture or forest |
|  | 8 | Land with very severe to extreme limitations or hazards that make it unsuitable for cropping, pasture or forestry |

|  |  |  |
| --- | --- | --- |
|  | ***LUC subclass modifier*** | ***Description*** |
|  | e | erosion susceptibility, deposition or the effects of past erosion damage first limits production |
|  | w | soil wetness resulting from poor drainage or a high water table, or from frequent overflow from streams or coastal waters first limits production |
|  | s | soil physical or chemical properties in the rooting zone such as shallowness, stoniness, low moisture holding capacity, low fertility (which is difficult to correct), salinity, or toxicity first limits production |
|  | c | climatic limitations such as coldness, frost frequency, and salt-laden onshore winds first limits production |

|  |  |  |
| --- | --- | --- |
|  | ***LUC unit identifier*** | ***Description*** |
|  | 1  2  : | A number that makes the combined LUC expression unique. It associates and orders polygons below the level of LUC subclass, on the basis of common landform, productive potential, physical limitation and management behaviour |

**3. lcorr.** An lcorr expression is exactly the same notation as a single LUC expression, but may be suffixed by a qualifying character.

|  |  |  |
| --- | --- | --- |
|  | ***lcorr suffix*** | ***Description*** |
|  |  | denotes that the regional (original) LUC unit has been split and there have been separate correlations to other correlation units. For example, 1c1 in Wairarapa-Southern Hawke’s Bay correlates to NI unit 1c1 for 11 730 ha but correlates to NI unit 1c2 for the remaining 530 ha. |
|  |  | denotes a moderate correlation only between regional LUC units. For example, 44 700 ha of 3w1 in Wairarapa-southern Hawkes Bay correlates on a best-fit basis to NI unit 3w6. |
|  | # | denotes a unit that is both a moderate correlation *and* has been split. |

**4. Other permitted values (for LUC and lcorr)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Item code* | *Description* |  | *Item code* | *Description* |
|  | estu | estuary |  | ice | icefield |
|  | lake | lake |  | rive | river |
|  | quar | quarry, mine, other earthworks |  | town | urban area, airport, oxidation pond |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**Item format:** **1. legend** is a right justified character item as described above.

**2. LUC** is formatted, allowing up to two, LUC unit expressions, thus:

csuu+csuu

where: c —is the LUC Class (Roman numerals on published maps)

s —is the subclass modifier

uu —is the LUC Unit identifier.

**2. lcorr** is formatted, allowing one qualified LUC correlation unit expression, thus:

csuuq

where: c —is the LUC Class (Roman numerals on published maps)

s —is the subclass modifier

uu —is the LUC Unit identifier

q —is the correlation qualifier (refer Item values above)

**Interpretation:** As there are separate LUC classifications for each NZLRI survey region, a Land Use Capability expression must be interpreted in the context of its **legend**.

A polygon is most commonly described by just one LUC expression, but occasionally a second LUC is included to identify a subdominant component of the landscape.

To be meaningful, a LUC expression must be read cumulatively from the start of the expression (i.e. LUC class 7 is meaningful by itself, but the subclass modifier ‘w’ is not. The latter must be read together with its associated class as ‘7w’).

Example: 7w 4 denotes an area of LUC class 7 land whose major limitation is wetness. Being class 7 land this wetness must either be significant year-round or be periodically marshy. More detailed characteristics of the land can be obtained by looking up ‘7w 4’ in the appropriate regional LUC extended legend or regional LUC classification bulletin.

**lcorr** is identical in nature to LUC and may be interpreted in much the same

way. Regard should be paid to any qualifying suffix in **lcorr** to determine how ‘good a fit’ the regional LUC expression is to the more general correlation unit. Page (1985) describes the North Island LUC correlation units, while Lynn (1996) correlates the 2nd Edition Marlborough LUC units back to the South Island classification.

**Comments:** Figure 1 illustrates the geographic extent of the NZLRI survey regions identified by **legend**.

The Land Use Capability system of land classification was originally developed by the US Department of Agriculture and adapted for New Zealand conditions by the Soil Conservation and River Control Council in the 1950s. The New Zealand system, as implemented later in the NZLRI, is described in the Land Use Capability Handbook (SCRCC 1971).

Each LUC Unit is described in detail in a Regional LUC Extended Legend that accompanies the published NZLRI maps. These descriptions are amplified for some regions in a Regional LUC Classification Bulletin (see references, below). The Extended Legends briefly characterise each LUC unit in terms of its physiography, land use, potential erosion, and aspects of productivity and management. The Regional Bulletins compare the various LUC units and relate them to each other, as well as giving detailed descriptions of each.

**References:** Blaschke, P. M.. 1985: Land use capability classification and land resources of the Bay of Plenty – Volcanic Plateau region. *Water & Soil Miscellaneous Publication 89*. Wellington, New Zealand, National Water and Soil Conservation Authority. 222p.

Fletcher, J. R. 1987: Land use capability classification of the Taranaki – Manawatu Region. *Water & Soil Miscellaneous Publication 110*. Wellington, New Zealand, National Water and Soil Conservation Authority. 228p.

Harmsworth, G. R. 1996: Land use capability classification of the Northland region. *Landcare Research Science Series 9*. Lincoln, New Zealand, Manaaki Whenua Press. 269p.

Jessen, M. R.; Crippen, T. F.; Page, M. J.; Rijkse, W. C.; Harmsworth, G. R.; McLeod, M. 1999: Land use capability classification of the Gisborne – East Coast region. *Landcare Research Science Series 21*. Lincoln, New Zealand, Manaaki Whenua Press. 213p.

Lynn, I. H. 1996: Land use capability classification of the Marlborough region. *Landcare Research Science Series 12*. Lincoln, New Zealand, Manaaki Whenua Press. 222p.

Noble, K. E. 1985: Land use capability classification of the Southern Hawke’s Bay – Wairarapa Region. *Water & Soil Miscellaneous Publication 74*. Wellington, New Zealand, National Water and Soil Conservation Authority. 128p.

Page, M. J.1985: Correlation of North Island regional land use capability units from the New Zealand Land Resource Inventory. *Water & Soil Miscellaneous Publication 75*. Wellington, New Zealand, National Water and Soil Conservation Authority. 107p.

Page, M. J. 1988: Land use capability classification of the Northern Hawke’s Bay region. *Water & Soil Miscellaneous Publication 109*. Wellington, New Zealand, National Water and Soil Conservation Authority. 206p.

Page, M. J. 1995: Land use capability classification of the Wellington region. *Landcare Research Science Series 6*. Lincoln, New Zealand, Manaaki Whenua Press. 127p.

SCRCC 1971: Land use capability survey handbook. 2nd ed. Wellington, New Zealand, Water and Soil Division, Ministry of Works. 138p.

# Lithology (NZLRI Ed1)

**Description:** Polygon layer delineating physiographic areas of relatively homogenous surface and near-surface lithology (rock type). This expression is segregated to identify the principal surface lithology and the principal underlying lithology.

**Origin:** Derived from stereo aerial photograph interpretation, field verification and measurement as part of the 1:63 360/1:50 000 scale New Zealand Land Resource Inventory.

**Item name(s):**  rock, toprock, baserock

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item definition(s):** | ***Name*** | ***Item width*** | ***Output width*** | ***Type*** | ***Decimals*** |
|  | rock | 28 | 28 | c | - |
|  | toprock | 3 | 3 | c | - |
|  | baserock | 3 | 3 | c | - |

**Item values:** The classification of the NZLRI 1st Edition lithology differs between the North and South Islands. **toprock** and **baserock** are derivations of **rock** using the same item codes and rock type classification.

1. North Island **rock**, **toprock**, and **baserock** classification

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | ***Item code*** | ***Rock type class*** | ***Item code*** | ***Rock type class*** |
|  | Igneous Rocks | | | |
|  | Ng | Ngauruhoe ash | Rm | Rotomahana mud |
|  | Ta | Tarawera ash and lapilli | Sc 1 | Scoria |
|  | Lp | Lapilli | Kt | Kaharoa & Taupo ashes |
|  | Tp | Taupo & Kaharoa breccia & volcanic alluvium | Mo | Ashes older than Taupo pumice |
|  | Ft | Breccias older than Taupo breccia | La | Lahar deposits |
|  | Vu 1 | ‘Soft’ volcanic rocks | Vo | Lavas, ignimbrite & other ‘hard’ volcanic rocks |
|  | Gn | Crystalline intrusive rocks | Um 1 | Ultramafics |
|  |  | | | |
|  | Pt | Peat | Lo | Loess |
|  | Wb | Sands — windblown | Gr | Gravels |
|  | Al | Undifferentiated floodplain alluvium | Us | Unconsolidated to moderately consolidated clays, silts, sands, tephra & breccias |
|  | Mm | Mudstone or fine siltstone — massive | Mb | Mudstone or fine siltstone — banded |
|  | Mj | Mudstone or fine siltstone — jointed | Me | Mudstone — bentonitic |
|  | Sm | Sandstone or coarse siltstone — massive | Sb | Sandstone or coarse siltstone — banded |
|  | Cw | Weakly consolidated conglomerate | Mx | Sheared mixed lithologies |
|  | Cg | Conglomerate & breccia | Ac | Argillite — crushed |
|  | Ar | Argillite | Gw | Greywacke |
|  | Li | Limestone |  |  |
|  | Other permitted values | | | |
|  | estu | estuary | ice | icefield |
|  | lake | lake | rive | river |
|  | quar | quarry, mine, other earthworks | town | urban area, airport, oxidation pond |

1 These rock types do not appear on the published NZLRI maps, but are recorded in the computer database.

Maps published before 1977 use time-stratigraphic and other symbols from published geological maps instead of the above symbols (see Crippen & Eyles 1985). The computer database, however, records only the rock type symbols above.

Changes to the classification have occurred during the survey, Refer to Crippen and Eyles (1985) for a more detailed description of the classification.

2.South Island **rock**, **toprock**, and **baserock** classification

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | ***Item code*** | ***Rock type class*** | ***Item code*** | ***Rock type class*** |
|  | Surficial Rock Types | | | |
|  | Al | Alluvium, colluvium, glacial drift | Wb | Windblown sand |
|  | Lo | Loess | Pt | Peat |
|  | Sedimentary Rock Types: weakly indurated | | | |
|  | Ms | Mudstone | Ss | Sandstone |
|  | Fy | Interbedded sandstone & mudstone | Cw | Conglomerate |
|  | Sedimentary Rock Types: strongly indurated | | | |
|  | Ar | Argillite | Hs | Sandstone |
|  | Gw | Greywacke | Cg | Conglomerate |
|  | Ls | Limestone |  |  |
|  | Igneous Rock Types | | | |
|  | Tb | Pyroclastics (ash & lapilli) | Vo | Lavas |
|  | In | Ancient volcanoes, minor intrusives (dikes & sills) | Gn | Plutonics |
|  | Um | Ultramafics |  |  |
|  | Metamorphic Rock Types | | | |
|  | St1 | Semi-schist | St2 | Schist |
|  | Gs | Gneiss | Ma | Marble |
|  | Other permitted values | | | |
|  | estu | estuary | ice | icefield |
|  | lake | lake | rive | river |
|  | quar | quarry, mine, other earthworks | town | urban area, airport, oxidation pond |

For a more detailed description of this classification refer to Lynn 1985.

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**Item format:** **1. rock** is free formatted left justified character text, allowing up to five, qualified, lithology expressions.

**2. toprock** and **baserock** are both free formatted left justified character text, allowing a single, qualified, lithology expression.

**Interpretation:** **1. rock** describes the lithology of the map unit beginning with the surface and/or dominant rock type and ending with the basement and/or least prominent rock type.

Qualifying characters may be interspersed in the ‘**rock**’ expression to identify particular states or relationships of the rock types. These characters and their meaning are as follows:

‘ —indicates deep weathering, e.g., Vo’

+ —indicates a combination of rock types, e.g., Lo+Al

() —indicates significant in patches, e.g., (Al).

/ —indicates stratigraphic succession, surface rock first, e.g., Al/Gw

Examples: (Lo)+Al/Gr denotes a map unit with a surface lithology of alluvium interspersed with patches of loess, both of which are underlain by gravels.

Ar’/Gw+Mm denotes a map unit dominated by weathered argillite overlying greywacke but with inclusions of massive mudstone (occurring at the surface and at depth).

**2. toprock** is identical in nature to **rock**. It has simply reduced **rock** to the first-named entire (i.e. not patchy) rock type, irrespective of any succeeding stratigraphy. The examples below illustrate the derivation of **toprock** from **rock**.

Examples: rock — Ar+Gw toprock — Ar

rock — Al+Lo/Gw toprock — Al

rock — (Al)/Ss+Cg toprock — Ss

rock — (Lo)+Al/Ss+Mn toprock — Al

rock — Lo/Al/In+Ss toprock — Lo

rock — Cg toprock — Cg

**3. baserock** is identical in nature to **rock**. It has simply reduced **rock** to a single value that identifies the principal basement lithology. The derivation of **baserock** takes initial note of the qualifying symbols in **rock** as outlined in the sequential rules and examples below:

a) Any ‘patchy’ rock type and any associated symbol associated with a patchy rock (e.g. (Al)/, (Al+Ss)/, (Lo)+, etc.) is ignored.

b) Thence, if **rock** contains a ‘+’ followed by a ‘/’, then **baserock** is the first named entire rock type:

Examples: rock — Al+Lo/Gw baserock — Al

rock — Al+Wb/Ss+Ms baserock — Al

c) Next, if **rock** contains a ‘/’, that is not preceded by a ‘+’, then **baserock** is the next-named rock type after the last ‘/’:

Examples: rock — Al/Vo+Ms baserock — Vo

rock — Lo/Al/In+Ss baserock — In

d) The remainder should be where **rock** does not contain a ‘/’, whereupon **baserock** is the first-named entire rock type:

Examples: rock — Ar+Gw baserock — Ar

rock — Cg baserock — Cg

**Comments:** The **rock** classification was used in NZLRI mapping between 1973 and 1983. At the outset of 1:50 000 scale 2nd Edition mapping in 1983, the NZLRI lithology classification and recording notation was considerably improved. The revised classification is documented separately from this classification (refer to ‘Lithology (NZLRI ED2)' where the item is called **rock2**). **rock2** has been recorded only in those areas of 1:50 000 scale remapping of the NZLRI and cannot be retrospectively applied to earlier mapping. To permit national analyses of lithology, areas covered by 2nd Edition 1:50 000 scale mapping have had their **rock2** record correlated to **rock** notation. Therefore, areas of 2nd Edition 1:50 000 scale mapping have entries in both **rock** and **rock2**, while areas of Edition1 NZLRI mapping have entries in **rock** only.

A correlation table from Lithology 2nd edition (**rock2**) notation 1st Edition (**rock**) notation, together with some correlation notes are contained in Appendix 1.

**References:** Crippen, T. F., Eyles, G. O. 1985: The New Zealand Land Resource Inventory rock type classification. Part 1: North Island. *Water & Soil Miscellaneous Publication 72*. Wellington, New Zealand, National Water and Soil Conservation Authority. 74p.

Lynn, I. H. 1985: The New Zealand Land Resource Inventory rock type classification. Part 2: South Island. *Water & Soil Miscellaneous Publication 73*. Wellington, New Zealand, National Water and Soil Conservation Authority. 66p.

# Lithology (NZLRI Ed2)

**Description:** Polygon layer delineating physiographic areas of relatively homogenous surface and near-surface lithology (rock type).

**Origin:** Derived from stereo aerial photograph interpretation, field verification and measurement as part of the 1:50 000 scale 2nd Edition New Zealand Land Resource Inventory.

**Item name(s):**  rock2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item definition(s):** | ***Name*** | ***Item width*** | ***Output width*** | ***Type*** | ***Decimals*** |
|  | rock2 | 28 | 28 | c | - |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item values:** | ***Item code*** | ***Rock type class*** | ***Item code*** | ***Rock type class*** |
|  | Igneous Rocks: (i) extremely weak to weak | | | |
|  | Ng | Ngauruhoe tephra | Rm | Rotomahana mud |
|  | Ta | Tarawera tephra | Sc | Scoria |
|  | Lp | Pumiceous lapilli | Kt | Kaharoa & Taupo ashes |
|  | Tp | Taupo & Kaharoa breccia & pumiceous alluvium | Mo | Ashes older than Taupo ash |
|  | Ft | Quaternary breccias older than Taupo breccia | La | Lahar deposits |
|  | Vu | Extremely weak altered volcanics |  |  |
|  | Igneous Rocks: (ii) weak to extremely strong | | | |
|  | Vo | Lavas & welded ignimbrites | Tb | Indurated fine-grained pyroclastics |
|  | Vb | Indurated volcanic breccias | In | Ancient volcanics |
|  | Gn | Plutonics | Um | Ultramafics |
|  | Sedimentary Rocks: (i) very loose to compact (very soft to stiff) | | | |
|  | Pt | Peat | Lo | Loess |
|  | Wb | Windblown sand | Af | Fine alluvium |
|  | Gr | Alluvium gravels | Cl | Coarse slope deposits |
|  | Gl | Glacial till | Uf | Unconsolidated clays & silts |
|  | Us | Unconsolidated sands & gravels |  |  |
|  | Sedimentary Rocks: (ii) very compact (very stiff) to weak | | | |
|  | Mm | Massive mudstone | Mb | Bedded mudstone |
|  | Mf | Frittered mudstone or jointed mudstone | Me | Bentonitic mudstone |
|  | Sm | Massive sandstone | Sb | Bedded sandstone |
|  | Cw | Weakly consolidated conglomerate | Mx | Sheared mixed lithologies |
|  | Ac | Crushed argillite association of rocks |  |  |
|  | Sedimentary Rocks: (iii) moderately strong to extremely strong | | | |
|  | Ar | Argillite | Si | Indurated sandstone |
|  | Cg | Conglomerate & breccia | Gw | Greywacke association of rocks |
|  | Li | Limestone |  |  |
|  | Metamorphic Rocks | | | |
|  | Sx | Semi-schist | Sy | Schist |
|  | Gs | Gneiss | Ma | Marble |
|  | Other permitted values | | | |
|  | estu | estuary | ice | icefield |
|  | lake | lake | rive | river |
|  | quar | quarry, mine, other earthworks | town | urban area, airport, oxidation pond |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**Item format:** **rock2** is free formatted left justified character text, allowing up to five, qualified, lithology expressions.

**Interpretation:** **rock2** describes the lithology of the map unit beginning with the surface and/or dominant rock type and ending with the basement and/or least prominent rock type.

Qualifying characters may be interspersed in **rock2** to identify particular states or relationships of the rock types. These characters, and their meaning are as follows:

c —indicates crushed and sheared rocks, e.g., cGw.

w —indicates deep weathering, e.g., wVo.

p —indicates significant in patches, e.g., pAf.

\* —used in association with ‘/’, indicates that the rock types linked by the asterisk are both overlain by the preceding rock type, e.g., Lo/Sm\*Li denotes loess overlying both massive sandstone and limestone. This contrasts with Lo/Sm+Li, where the loess overlies the Sm only.

+ —indicates a combination of rock types.

/ —indicates stratigraphic succession, surface rock first, e.g., Af/Gw.

Examples: pLo+Af/Gr denotes a map unit with a surface lithology of fine alluvium interspersed with patches of loess, both of which are underlain by gravels.

wAr/Gw+Mm denotes a map unit dominated by weathered argillite overlying greywacke but with inclusions of massive mudstone (both at the surface and at depth).

**Comments:** **rock2** has only been mapped in those areas covered by 1:50 000 scale 2nd Edition mapping of the NZLRI. In these areas, the **rock2** records have also been correlated to the earlier **rock** notation to permit national analyses of lithology, using the most recent mapping available. Therefore, areas of 2nd Edition 1:50 000 scale mapping have entries in both **rock** and **rock2**, while areas of 1st Edition NZLRI mapping have entries in **rock** only.

A correlation table from Lithology 2nd Edition (**rock2**) notation to 1st Edition (**rock**) notation, together with some correlation notes, are contained in Appendix 1.

# Soil unit description

**Description:** Polygon layer delineating physiographic areas described by a variety of soil names and classifications.

**Origin:** Derived from stereo aerial photograph interpretation, field verification and measurement as part of the 1:63 360/1:50 000 scale New Zealand Land Resource Inventory survey, supplemented with more detailed single factor soil surveys as appropriate. In most areas, only the **soil** record has been mapped in the field. Other factors are correlations from the mapped soil.

**Item name(s):**  survey, surcode, domsoi, soil, series, type, phase, gensoi, nzsc, nzgsoigrp

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item definition(s):** | ***Name*** | ***Item width*** | ***Output width*** | ***Type*** | ***Decimals*** |
|  | survey | 32 | 32 | c | - |
|  | surcode | 4 | 4 | c | - |
|  | domsoi | 8 | 8 | c | - |
|  | soil | 22 | 22 | c | - |
|  | series | 35 | 35 | c | - |
|  | type | 46 | 46 | c | - |
|  | phase | 35 | 35 | c | - |
|  | gensoi | 5 | 5 | c | - |
|  | nzsc | 19 | 19 | c | - |
|  | nzgsoigrp | 10 | 10 | c | - |

**Item values:** **1. survey** & **surcode** identifies the soil survey to which the **domsoi** and **soil** code (below) refers. **survey** and **surcode** values and their meaning are presented in Appendix 2 (see also ‘Other permitted values’ below).

**2. domsoi** identifies the first-named **soil** code and has identical nomenclature. (see also ‘Other permitted values’ below).

**3. soil** is coded according to the symbols used in the original soil surveys. These symbols are too numerous to list here. Users must refer to the legends of the soil surveys referenced under **survey** and **surcode**. (see also ‘Other permitted values’ below).

**4. series, type, phase** expressions are described according to the nomenclature of the original soil surveys and are, again, too numerous to list here. Users must refer to the legends of the soil surveys referenced under **survey** and **surcode**. (see also ‘Other permitted values’ below).

**5. gensoi** correlates the mapped **domsoi** to the nomenclature of the General Surveys of Soil of North and South islands (New Zealand Soil Bureau 1954, 1968b). These symbols are, again, too numerous to list here and users are referred to the foregoing publications. (see also ‘Other permitted values’ below).

**6. nzsc.** For most of the country, **nzsc** is a correlation to the mapped **domsoi**. An exception is the 1:50 000 scale 2nd Edition NZLRI mapping of the Gisborne - East Coast region, where soils were mapped directly to the New Zealand Soil Classification. Nomenclature for **nzsc** is taken from Hewitt (1998) and is presented in Appendix 3. (see also ‘Other permitted values’ below).

**7. nzgsoigrp** correlates the mapped **domsoi** to the New Zealand Genetic Soil Group (Taylor & Pohlen 1970, New Zealand Soil Bureau 1968a) and is presented in Appendix 4 (see also ‘Other permitted values’ below).

**8. Other permitted values (for survey, surcode, domsoi, soil, series, type, phase, gensoi, nzsc, nzgsoigrp**)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | ***Item code*** | ***Description*** |  | ***Item code*** | ***Description*** |
|  | BRock | Bare Rock |  | DTail | Dredge Tailings |
|  | MSoil | Mountain soils (NI only) |  | OWork | Old workings from mining operations |
|  | SKele | Skeletal soils |  | @NZSC | Only NZSC codes were recorded in Gisborne District. Refer to the NZSC field in the NZFSL |
|  | estu | estuary |  | ice | icefield |
|  | lake | lake |  | rive | river |
|  | quar | quarry, mine, other earthworks |  | town | urban area, airport, oxidation pond |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values as described above.

**Item format:** **1. survey** is free formatted left justified character text.

**2. surcode** is a single character text.

**3. domsoi** is simply the first named code in **soil** and shares exactly the same formatting as below.

**4. soil.** A ‘**soil**’ record may identify up to three soil components for the polygon, listing these in descending order of prominence, thus:

aaaaaaaa+bbbbbb+cccccc

where: aaaaaaaa —is the dominant soil in the polygon

bbbbbb —is the next most prominent soil

cccccc —is the least prominent soil

Within each soil component, the soil expression is usually unformatted and left justified, unless the soil code is from the general survey of soils of the South or North Island. In the latter event, the soil code is formatted within the first five character spaces as described for **set** below.

**5. series** is free formatted left justified character text.

**6. type** is free formatted left justified character text.

**7. phase** is free formatted left justified character text.

**8. gensoi** is formatted thus:

nnngh

where: nnn —is the soil set number (right justified)

g —is the soil subgroup character (a-j) or is blank

h —is the soil phase character (H or S) or is blank.

**9. nzsc** is formatted left justified character text, allowing up to four nzsc elements to be recorded in descending order of prominence. Each nzsc element is allocated four character spaces with multiple elements separated by a ‘+’.

**10. nzgsoigrp** is free formatted left justified character text.

**Interpretation:** **1. survey.**

Example Piako County signifies that the soil record which follows originates from: Wilson, A.D. 1980: Soils of Piako County, North Island New Zealand. *NZ Soil Survey Report 39* (refer Appendix 2).

**2. surcode.**

Example PIAK a field which, in this case, identifies the above survey in an abbreviated form.

**3. domsoi**, like **soil** below, must be interpreted in the context of the relevent soil survey (refer **survey** and **surcode**). Once the legend of the appropriate soil survey has been identified, then the soil code can be interpreted from this legend.

Example TeH identifies Tauhei Hill Soils as the dominant soil in the map unit. Any subdominant soils will be revealed in the **soil** record below.

**4. soil**

Example TeH+MmH denotes a map unit the soil of which is dominantly Tauhei Hill Soils with subdominant areas of Maramarua Hill Soils.

**5. series.**

Example Tauhei identifies Tauhei soils as the dominant soil series (or set) in the map unit.

**6. type.**

Example silt loam identifies silt loam as the dominant texture of the upper horizon of the soil (this field is commonly blank).

**7. phase.**

Example hill identifies hill soils as being dominant in the map unit.

**8. gensoi.**

Example 46bH denotes (from reference to New Zealand Soil Bureau 1954) Hukerenui silt loam hill soil.

**9. nzsc.**

Example BOT denotes a Typic Orthic Brown soil.

**10. nzgsoigrp.**

Example. PYB denotes a Podsolised yellow-brown earth.

**Comments:**

**References:**

Clayden, B.; Hewitt, A. E.; McLeod, M.; Rijske, W.; Wallace, H.;

Wilde, R. H. 1997: North Island Soil Surveys: classification of named soils by subgroups of the New Zealand Soil Classification. *Landcare Research,* Lincoln, New Zealand

Hewitt, A. E. 1998: New Zealand Soil Classification. *Landcare Research Science Series 1*. 2nd ed. Lincoln, New Zealand, Manaaki Whenua Press.

New Zealand Soil Bureau 1954: General Survey of the soils of North Island, New Zealand. *New Zealand Soil Bureau Bulletin (n.s.) 5.*

New Zealand Soil Bureau 1968a: Soils of New Zealand, Pt 1. *New Zealand Soil Bureau Bulletin 26(1)*.

New Zealand Soil Bureau 1968b: General Survey of the soils of South Island, New Zealand. *New Zealand Soil Bureau Bulletin 27*.

Taylor, N. H.; Pohlen, I. J. 1970: Soil Survey Method. *New Zealand Soil Bureau Bulletin 25*.

Wallace, H.J.; Burgham, S.J.; Hewitt, A. E.; McIntosh, P. D.; Webb, T. H. 2000: South Island Soil Surveys: classification of named soils by subgroups of the New Zealand Soil Classification. *Landcare Research,* Lincoln, New Zealand

# Slope Class

**Description:** Polygon layer delineating physiographic areas of relatively homogeneous average slope class.

**Origin:** Derived from stereo aerial photograph interpretation, field verification and measurement as part of the 1:63 360/1:50 000 scale New Zealand Land Resource Inventory survey.

**Item name(s):**  slope

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item definition(s):** | ***Item name*** | ***Item width*** | ***Output width*** | ***Type*** | ***Decimals*** |
|  | slope | 11 | 11 | c | - |

|  |  |  |  |
| --- | --- | --- | --- |
| **Item values:** | ***Item code*** | ***Class description*** | ***Class range*** |
|  | A | Flat to gently undulating | 0–3° |
|  | B | Undulating | 4–7° |
|  | C | Rolling | 8–15° |
|  | D | Strongly rolling | 16–20° |
|  | E | Moderately steep | 21–25° |
|  | F | Steep | 26–35° |
|  | G | Very steep | >35°  (36–42°)[[1]](#footnote-1) |
|  | H | Precipitous | (>42°)1 |
|  | estu | estuary | |
|  | ice | icefield | |
|  | lake | lake | |
|  | quar | quarry, mine, other earthworks | |
|  | rive | river | |
|  | town | urban area, airport, oxidation pond | |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**Item format:** Slope is rigidly formatted, allowing up to two, qualified, slope expressions, thus: sdasd+sdasd

where: s —is one of the slope codes above

d —is a dissection character (‘) and is used only if it applies

a —is an intermediate character (/) and is used only if it applies

**Interpretation:** Examples: C denotes an area of dominantly rolling slopes between 8 and 15**°**

E +F denotes an area of compound slope, dominantly 21–25**°** but with some significant slopes of 26–35**°**

D /E denotes an area where average slope is intermediate between strongly rolling and moderately steep

A’ denotes virtually flat land dissected by gullies or terrace edges

**Comments:**

# Erosion form and degree

**Description:** Polygon layer delineating relatively homogeneous physiographic areas with an inventory of up to four significant erosion forms and their severities.

**Origin:** Derived from stereo aerial photograph interpretation, field verification and measurement as part of the 1:63 360/1:50 000 scale New Zealand Land Resource Inventory survey.

**Item name(s):**  erosion

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item definition(s):** | ***Name*** | ***Item width*** | ***Output width*** | ***Type*** | ***Decimals*** |
|  | erosion | 12 | 12 | c | - |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item values:** | ***Erosion form code*** | ***Erosion form name*** |  | ***Erosion form code*** | ***Erosion form name*** |
|  | Da | Debris avalanche |  | Rf | Rockfall |
|  | Ef | Earthflow |  | Rs | Riparian slip |
|  | Es | Earth slip |  | Sb | Streambank |
|  | Mf | Mudflow |  | Su | Slump |
|  | Ss | Soil slip |  | T | Tunnel gully |
|  | D | Deposition |  | Sc | Scree |
|  | G | Gully |  | Sh | Sheet |
|  | R | Rill |  | W | Wind |
|  | estu | estuary |  | ice | icefield |
|  | lake | lake |  | rive | river |
|  | quar | quarry, mine, other earthworks |  | town | urban area, airport, oxidation pond |

|  |  |  |  |
| --- | --- | --- | --- |
|  | ***Erosion severity symbol*** | ***Erosion severity description*** | ***Area of land affected (applicable to sheet wind and scree forms only)*** |
|  | 0 | negligible | negligible |
|  | 1 | slight | 1–10% |
|  | 2 | moderate | 11–20% |
|  | 3 | severe | 21–40% |
|  | 4 | very severe | 41–60% |
|  | 5 | extreme | >60% |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**Item format:** Erosion is rigidly formatted, allowing up to four, erosion form and severity expressions, thus: sttsttsttstt

where: s —is the assessed severity of the erosion form that follows

tt —is the erosion form code

**Interpretation:** The first erosion type is the dominant erosion form. Any erosion types which follow are recorded in descending order of prominence.

Examples: 0 denotes negligible erosion of any form

3G denotes an area with severe gully erosion

2Ss1Ef1Sh denotes an area where moderate soil slip is the dominant erosion form with slight earthflow and 1–10% of the unit area exposed to sheet erosion.

**Comments:** Sheet wind and scree are assessed on the basis of area affected by recognising the percentage of bare ground or eroding area within the map unit. The severity of the remaining erosion types is assessed on a basis of seriousness, taking into account rock type, rate and depth of movement, frequency of erosion events, feasibility and cost of control and economic effect.

In the NZLRI South Island 1st Edition data the first erosion severity record describes the erosion severity for all erosion types in the polygon, not just the type which follows it. Hence, since the first severity position is an assessment for the whole unit the second, third, and fourth severity positions (columns 4, 7, 10 of the erosion item) are always blank.

Eyles (1985) contains a more detailed description of the NZLRI erosion classification.

Following a review of inventory classifications at the onset of 1:50 000 scale 2nd Edition mapping the erosion form codes were slightly modified from those used on the published maps. These modifications have been incorporated nationally into the LRIS spatial data layers.

**References:** Eyles, G. O. 1985: The New Zealand Land Resource Inventory erosion classification. *Water & Soil Miscellaneous Publication 85*. Wellington, New Zealand, National Water and Soil Conservation Authority. 61p.

# Vegetation inventory (NZLRI Ed1)

**Description:** Polygon layer delineating areas defined either physiographically or on the basis of vegetation differences, containing an inventory of vegetative cover classes with a general indication of areal extent.

**Origin:** Derived from stereo aerial photograph interpretation, field verification and measurement as part of the 1:63 360/1:50 000 scale New Zealand Land Resource Inventory survey.

**Item name(s):**  veg

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item definition(s):** | ***Name*** | ***Item width*** | ***Output width*** | ***Type*** | ***Decimals*** |
|  | veg | 24 | 24 | c | - |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item values:** | ***Vegetation code*** | ***Vegetation class*** | ***Vegetation code*** | ***Vegetation class*** |
|  | Cropland | | | |
|  | L | Unspecified crops | L1 | Cereals |
|  | L2 | Orchards & vineyards | L3 | Root & green fodder crops |
|  | L4 | Horticultural crops |  |  |
|  | Grassland | | | |
|  | P | Unspecified grassland | P1 | High producing pasture |
|  | P2 | Low producing pasture | P3 | Short tussock grassland |
|  | P4 | Snow tussock grassland | P5 | Red tussock grassland |
|  | P6 | Sand dune vegetation |  |  |
|  | Scrubland | | | |
|  | M | Unspecified scrub | M1 | Manuka, kanuka |
|  | M2 | *Cassinia* | M3 | *Dracophyllum* |
|  | M4 | Fern | M5 | Subalpine scrub |
|  | M6 | Mixed native scrub | M7 | Broom |
|  | M8 | Gorse | M9 | Blackberry |
|  | M10 | Sweet brier | M11 | Matagouri |
|  | M12 | Mangroves | M13 | Mountain flax |
|  | Forest | | | |
|  | N | Unspecified forest | N1 | Coastal forest |
|  | N2 | Kauri forest | N3 | Podocarp-hardwood forest |
|  | N3a | Lowland podocarp-hardwood forest | N3b | Mid-altitude podocarp-hardwood forest |
|  | N4 | Beech forest | N4a | Lowland beech forest |
|  | N4b | Highland beech forest | N5 | Hardwood forest |
|  | N6 | Exotic forest | N7 | Podocarp forest |
|  | N8 | Conservation trees |  |  |
|  | Miscellaneous vegetation | | | |
|  | H | Unspecified herbaceous | H1 | Swamp vegetation |
|  | H2 | Rushes & sedges | H3 | Sand dune vegetation |
|  | H4 | Subalpine & alpine herbfield | H5 | Salt-tolerant vegetation |
|  | H6 | Pakihi vegetation | H7 | Semi-arid herbfield |
|  | - | Unvegetated land |  |  |
|  | estu | estuary | ice | icefield |
|  | lake | lake | rive | river |
|  | quar | quarry, mine, other earthworks | town | urban area, airport, oxidation pond |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**Item format:** **veg** is a formatted item, allowing up to six, qualified, vegetation expressions, thus: pgnnpgnnpgnnpgnnpgnnpgnn

where: p —is a prefix denoting an atypical condition (c or s) and is used only if it applies

g —identifies the vegetation structural group (forest, scrub, etc.)

nn —identifies the vegetation class within the vegetation group. This number is right-justified

**Interpretation:** The first vegetation class is the dominant vegetative cover in the map unit. Any vegetation classes that follow are recorded in descending order of prominence.

Where the vegetation group symbol is a capital letter, this indicates that vegetation class comprises greater than or equal to 40% of the map unit area. A lower case letter indicates less than 40% but greater than 10%. Conventionally, vegetation classes occupying less than 10% of the map unit area were not recorded.

The special prefixes c, C, s, S, were used to identify particular states of the vegetation class that follows. Their meaning is:

C —cutover (primarily applied to lowland indigenous forests)

c —cutover in patches (applied to lowland indigenous forests)

S —stunted (usually forest classes at or near treeline)

s —stunted in patches (usually forest classes at or near treeline).

Examples: P 2 m 8 denotes dominantly unimproved pasture with minor inclusions (10–40%) of gorse

cN4 n3a m 1 denotes (>40%) beech forest, cutover in places, with inclusions of both lowland podocarp hardwood forest and mixed native scrub, the former being more prominent than the latter but neither greater than 40% of the unit area.

**Comments:** On the published NZLRI maps of the South Island the vegetation record differs from both the North Island notation and the computer database. The South Island maps record vegetation *groups* in descending order of prominence rather than vegetation *classes*. The South Island system then identifies the significant class numbers, adjacent to each other, but separated by a comma. For example:

NI notation — P 1 M 1 p 2

SI notation — P 1, 2 M 1

On the computer database, the South Island notation has been converted to the North Island format as accurately as an office exercise will allow.

Hunter and Blaschke (1986) present a more detailed description of the vegetative cover classification.

The **veg** classification was used in NZLRI mapping between 1973 and 1983. At the outset of 1:50 000 scale, 2nd Edition mapping in 1983, the NZLRI vegetative cover classification and recording notation was considerably improved. The revised classification is documented separately from this classification (refer to ‘Vegetation inventory (NZLRI ED2)' where the item is called **veg2**). **veg2** has been recorded only in those areas of 1:50 000 scale remapping of the NZLRI and cannot be retrospectively applied to earlier mapping. However, to permit national analyses of vegetation, areas covered by 2nd Edition 1:50 000 scale mapping have had their **veg2** record correlated to **veg** notation. Therefore areas of 2nd Edition 1:50 000 scale mapping have entries in both **veg** and **veg2**, while areas of 1st Edition NZLRI mapping has entries in **veg** only.

**References:** Hunter, G. G.; Blaschke, P. M. 1986: The New Zealand Land Resource Inventory vegetation cover classification. *Water & Soil Miscellaneous Publication 101.* Wellington, New Zealand, National Water and Soil Conservation Authority.92 p.

# Vegetation inventory (NZLRI Ed2)

**Description:** Polygon layer delineating areas defined either physiographically or on the basis of vegetation differences, containing an inventory of vegetative cover classes with an indication of homogeneity and areal extent.

**Origin:** Derived from stereo aerial photograph interpretation, field verification and measurement as part of the 1:50 000 scale 2nd Edition New Zealand Land Resource Inventory.

**Item name(s):**  veg2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item definition(s):** | ***Name*** | ***Item width*** | ***Output width*** | ***Type*** | ***Decimals*** |
|  | veg2 | 24 | 24 | c | - |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item values:** | ***Vegetation code*** | ***Vegetation class*** | ***Vegetation code*** | ***Vegetation class*** |
|  | Crops | | | |
|  | cC | Cereal crops | cM | Maize |
|  | cP | Pip & stone fruit | cG | Grapes & berryfruit |
|  | cK | Kiwifruit | cS | Subtropical fruit |
|  | cR | Root & green fodder crops | cV | Vegetables or nurseries |
|  | Grass | | | |
|  | gI | Improved pasture | gS | Semi-improved pasture |
|  | gU | Unimproved pasture | gT | Short tussock grassland |
|  | gW | Snow tussock grassland | gR | Red tussock grassland |
|  | gD | Sand dune vegetation |  |  |
|  | Scrub | | | |
|  | sM | Manuka, kanuka | sC | *Cassinia* |
|  | sD | *Dracophyllum* | sF | Fern |
|  | sS | Subalpine scrub | sX | Mixed indigenous scrub |
|  | sT | Mixed indigenous scrub with tree ferns | sB | Broom |
|  | sG | Gorse | sK | Blackberry |
|  | sW | Sweet brier | sA | Matagouri |
|  | sV | Mangroves | sL | Lupins |
|  | sH | Heath | sO | Coastal scrub |
|  | sE | Exotic scrub |  |  |
|  | Forest | | | |
|  | fN | Kanuka forest | fC | Coastal forest |
|  | fK | Kauri forest | fP | Podocarp forest |
|  | fB | Broadleaved forest | fO | Lowland podocarp-broadleaved forest |
|  | fI | Highland podocarp-broadleaved forest | fD | Podocarp-broadleaved-beech forest |
|  | fW | Lowland beech forest | fG | Highland beech forest |
|  | fU | Beech forest (undifferentiated) | fR | Exotic broadleaved forest |
|  | fF | Exotic conifer forest |  |  |
|  | Herbaceous | | | |
|  | hW | Wetland vegetation | hR | Rushes & sedges |
|  | hA | Alpine & subalpine herbfield/fellfield | hS | Saline vegetation |
|  | hP | Pakihi vegetation | hM | Semi-arid herbfield |
|  | hH | *Hieracium* | uV | Unvegetated land |
|  |  |  |  |  |
|  | estu | estuary | ice | icefield |
|  | lake | lake | rive | river |
|  | quar | quarry, mine, other earthworks | town | urban area, airport, oxidation pond |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**Item format:** **veg2** is a formatted item, allowing up to six, qualified, vegetation expressions, thus: pgcapgcapgcapgcapgcapgca

where: p —is a prefix denoting a particular vegetation state or condition (c, s, e, n or r) and is used only if it applies

g —identifies the vegetation structural group (forest, scrub, etc.)

c —identifies the vegetation class within the vegetation group

a —specifies the percent of the map unit occupied by the vegetation class

**Interpretation:** The first vegetation class is the dominant vegetative cover in the map unit. Any vegetation classes that follow are recorded in descending order of prominence.

Each vegetation class is followed by a character that describes the distribution or extent of that class in the map unit. These characters, and their interpretation is as follows:

1 —an estimated 10% of the map unit is occupied by the class

2 —an estimated 20% of the map unit is occupied by the class

:

9 —an estimated 90% of the map unit is occupied by the class

0 —an estimated 100% of the map unit is occupied by the class

\* —an estimate of the class is impractical because it is homogeneously distributed within the preceding vegetation. The percentage area of the preceding vegetation should be read as the combined percentage area of the classes.

The special prefixes c, s, etc. are used to identify particular states of the vegetation class which followed. Their meaning is as follows:

c —cutover

s —stunted

e —erosion control trees

r —regenerating

n —naturalised exotic trees.

Examples: fB0 fK\* denotes a map unit entirely comprised of broadleaved forest but within which are scattered kauri

cS4 cK4 gI2 denotes that subtropical fruit and kiwifruit each occupy about 40% of the unit (although there is more of the former than the latter) with the rest of the map unit occupied by semi-improved pasture.

**Comments:** **Veg2** has only been mapped in those areas covered by 1:50 000 scale 2nd Edition mapping of the NZLRI. In these areas, the **veg2** records have been correlated to the earlier **veg** notation to permit national analyses of vegetation, using the most recent mapping available. Therefore areas of 2nd Edition 1:50 000 scale mapping have entries in both the **veg** and **veg2**, while areas of 1st Edition NZLRI mapping have entries in **veg** only.

A correlation table from Vegetation inventory 2nd Edition (**veg2**) notation to 1st Edition (**veg**) notation, together with some correlation notes, are contained in Appendix 5.

# Productivity Indices

**Description:** Polygon layer delineating land areas classified according to their stock carrying capacity (ewe equivalents, at three intensities of stocking), and site index for *Pinus radiata* (expressed as a range, an average, and a class).

**Origin:** Interpreted, for each predefined Land Use Capability unit delineated in the 1:63 360/1:50 000 scale New Zealand Land Resource Inventory survey.

**Item name(s):**  ccav, ccto, ccpo, prsir, prsic, prsiav

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item definition(s):** | ***Name*** | ***Item width*** | ***Output width*** | ***Type*** | ***Decimals*** |
|  | ccav | 4 | 4 | n | 1 |
|  | ccto | 4 | 4 | n | 1 |
|  | ccpo | 4 | 4 | n | 1 |
|  | prsir | 7 | 7 | c | - |
|  | prsic | 7 | 7 | c | - |
|  | prsiav | 2 | 2 | i | - |

**Item values**

**and interpretation:** **1. ccav, ccto, ccpo** have a numeric value, to one decimal place, usually between 0 and 25.

Stock carrying capacity is expressed in units of sheep-per-hectare (breeding ewe equivalents) (see Comments below). Stock carrying capacities are assessed at three intensities of stocking;

* the estimated average for all farmers(ccav),
* the estimated stocking rate for the top farmer (ccto),
* the estimated attainable physical potential stocking rate assuming favourable socio-economic conditions and management using all appropriate technologies and techniques (ccpo).

**2. prsir** may comprise a single numeric value (in the range 0–40) or two numerals separated by a hyphen.

Site Index is expressed in units of metres (see Comments below). **prsir** was assessed for each LUC unit using the combined expertise of land resource scientists and regional foresters. **prsic** and **prsiav** are derived from reference to **prsir**.

**3. prsic** may comprise a single site index class, or two classes separated by a hyphen.

|  |  |  |  |
| --- | --- | --- | --- |
| **Item values:** | ***prsic code*** | ***Class description*** | ***Site Index range*** |
|  | a.VH | Very high | >35 |
|  | b. H-VH | High to very high | >29 |
|  | c. H | High | 30–35 |
|  | d. M- H | Medium to high | 25–35 |
|  | e. M | Medium | 25–29 |
|  | f. L- M | Low to medium | 20–29 |
|  | g. L | Low | 20–24 |
|  | h.VL- L | Very low to low | <25 |
|  | i.VL | Very low | <20 |
|  | j. M-VH | Medium to very high | >24 |
|  | k. L-VH | Low to very high | ≥20 |
|  | l. l- H | Low to high | 20–35 |
|  | m.VL-VH | Very low to very high | >0 |
|  | n.VL- H | Very low to high | ≤35 |
|  | o.VL- M | Very low to medium | <30 |
|  | p.US | Unsuitable | 0 |
|  | estu | estuary | |
|  | ice | icefield | |
|  | lake | lake | |
|  | quar | quarry, mine, other earthworks | |
|  | rive | river | |
|  | town | urban area, airport, oxidation pond | |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**4. prsiav** is a single integer value (in the range 0–40) derived from the site index value (or range of values) contained in **prsir**, as follows:

* where **prsir** is a single number, **prsiav** takes the value of that number
* where **prsir** is a pair of numbers, **prsiav** is the average of those numbers
* where **prsir** is <15, **prsiav** is 10
* where **prsir** is <15–18, **prsiav** is 15
* where **prsir** is <15–20, **prsiav** is 15
* where **prsir** is <18, **prsiav** is 15

Non-normal units (lakes, towns, etc.) and the ArcInfo ‘world polygon’ have a value of 0.

**Item format:** Numeric fields (ccav, ccto, ccpo, prsiav) take the format dictated by the database system

Character fields (prsir, prsic) are left justified.

**Comments:** Stock Carrying Capacity, although expressed in ewe-equivalents, can be related to other farm stock (e.g., dairy cows, goats, deer, etc.) by using conversion factors available from farm advisory agencies.

Stock Carrying Capacity figures were not collected for the 2nd Edition Gisborne—East Coast mapping. Therefore, where **legend** equals 06 and **edition** equals 2.2 the values of 0.0 for **ccav**, **ccto**, and **ccpo** represent null values rather than carrying capacities of zero.

Site index is an estimate (or measurement) of the mean height (in metres) of the 100 tallest 20-year-old trees in a sampled hectare. *Pinus radiata* was adopted as the species standard because of its ubiquity in New Zealand, and not because it is necessarily the most suitable species for the site. Selective and genetic breeding programmes focussing on *Pinus radiata* have, in recent years, produced clones with growth rates significantly higher than those recorded in the LRIS database. High growth rates have often been achieved at a cost of lower wood density.

# Soil Chemical attributes

**Description:** Polygon layer delineating land areas classified according to the following key soil chemical attributes; minimum pH (0.2–0.6 m depth), maximum salinity (0–0.6 m depth), cation exchange capacity (0–0.6 m depth), total carbon (0–0.2 m depth), phosphate retention (0–0.2 m depth).

**Origin:** Interpreted, for each predefined **soil** in the 1:63 360/1:50 000 scale New Zealand Land Resource Inventory survey either from reference to analytical results stored in the National Soils Database (NSD) or as professional estimates by pedologists acknowledged as authorities in the soils of the region in question.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item name(s) & definition(s):** | Each soil attribute has an identical set of six items identifying a class, a minimum, maximum, and mod-value, and two items that identify the attribute variability (in terms of class intervals), and the origin of the estimate. ArcInfo field definitions (Item width, Output width, Type, and Number of decimals) are indicated in parentheses below their respective class name, thus: | | | | |
|  | ***pH*** | ***Salinity*** | ***CEC*** | ***Carbon*** | ***P retention*** |
|  | PH\_CLASS  (1,1,c,-) | SAL\_CLASS  (1,1,c,-) | CEC\_CLASS  (1,1,c,-) | CARBON\_CLASS  (1,1,c,-) | PRET\_CLASS  (1,1,c,-) |
|  | PH\_MIN  (3,3,n,1) | SAL\_MIN  (4,4,n,2) | CEC\_MIN  (5,5,n,1) | CARBON\_MIN  (4,4,n,1) | PRET\_MIN  (3,3,i,-) |
|  | PH\_MAX  (3,3,n,1) | SAL\_MAX  (4,4,n,2) | CEC\_MAX  (5,5,n,1) | CARBON\_MAX  (4,4,n,1) | PRET\_MAX  (3,3,i,-) |
|  | PH\_MOD  (3,3,n,1) | SAL\_MOD  (4,4,n,2) | CEC\_MOD  (5,5,n,1) | CARBON\_MOD  (4,4,n,1) | PRET\_MOD  (3,3,i,-) |
|  | PH\_VAR  (2,2,c,-) | SAL\_VAR  (2,2,c,-) | CEC\_VAR  (2,2,c,-) | CARBON\_VAR  (2,2,c,-) | PRET\_VAR  (2,2,c,-) |
|  | PH\_EST  (2,2,c,-) | SAL\_EST  (2,2,c,-) | CEC\_EST  (2,2,c,-) | CARBON\_EST  (2,2,c,-) | PRET\_EST  (2,2,c,-) |

|  |  |
| --- | --- |
| **Item values & interpretation:** | Item values for each soil attribute are presented below. Interpretation of these values is implicit in the description and any explanatory notes. |

1. **\_MOD values:** Values for \_MOD are calculated for each record, as the estimated modal value for a particular class. These modal values are calculated using the class range and variability (\_VAR) and are considered to approximate the most common value. The formula differs between soil factors whose values decrease with class number (e.g. pH) and factors whose values increase with class number (e.g. Salinity), as follows:

Where factor values decrease as class number rises

**Mod =** (Cn+Cx)/2 - (Vars ((Cx-Cn)/3))

Cn = Class minimum value

Cx = Class maximum value

Vars = Value of var not = 0 (i.e. 1+, 1-, 2+, 2-)

e.g. a CEC of class 3 with a \_VAR value of 1- is calculated as follows:

**Mod =** (12+24.9)/2 - (-1((24.9-12)/3)

**=** 22.8

Where factor values increase as class number rises

**Mod =** (Cn+Cx)/2 + (Vars ((Cx-Cn)/3))

e.g. a Salinity of class 2 with a \_VAR value of 1- is calculated as follows:

**Mod =** (0.05+0.14)/2 + (-1((0.14-0.05)/3)

= 0.065

**2. \_VAR values:** The variability field describes the likely distribution of measured theme values in terms of attribute classes. The field values and their meaning is as follows:

0 —Occurs mostly within the nominated class. The middle of the nominated class is a good approximation for a numerical value.

1 —Straddles the class above and below. The mean is the middle of the nominated class.

1- —Straddles this class and the class below. The mean is taken at the class boundary.

1+ —Straddles this class and the class above. The mean is taken at the class boundary.

2 —Straddles 2 classes above and below. The mean is the middle of the nominated class.

**3. \_EST values:** The estimation field describes the origin of the chosen theme value. The field values and their meaning is as follows:

m —Estimated from analyses or measurements of the named soil.

r —Estimated from relationships with other soils but this estimate is considered to be reliable.

u —Estimated from relationships with other soils but with an unknown level of accuracy.

uf —Estimated from General Soil Survey data (scale 1:253 440). In general, the quality of the estimate is less reliable than class ‘u’ above.

p —Deduced from soil profile morphology. This code has been used only in the South Island.

**4. Minimum pH:** The classes originate from Parfitt (1984), and are described more fully in Webb and Wilson (1995). pH classes and their corresponding values, described in relation to plant growth, are as follows:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Item values:** | ***PH\_***  ***CLASS*** | ***PH\_***  ***MIN*** | ***PH\_***  ***MAX*** | ***PH\_***  ***MOD*** | ***Description*** | ***Notes on plant growth relationships*** |
|  | 1 | 7.6 | 8.3 | Refer comment under ‘Item values & Interpretation’ | High | May seriously retard plant growth. |
|  | 2 | 6.5 | 7.5 | Moderately high | May depress growth, possible deficiencies of some nutrients may be induced. |
|  | 3 | 5.8 | 6.4 | Near neutral | Satisfactory pH for many plants. |
|  | 4 | 5.5 | 5.7 | Moderately low | Earthworm numbers, microbial activity, and nutrient cycling may be restricted. |
|  | 5 | 4.9 | 5.4 | low | Al often toxic and probably limits growth. |
|  | 6 | 4.5 | 4.8 | Very low | Both Al and Mn are likely to be toxic. |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**5. Maximum salinity:** Salinity is measured as percent soluble salts (g/100g soil). Salinity classes are described more fully in Webb and Wilson (1995) and Milne *et al.* (1991).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item values:** | ***SAL\_***  ***CLASS*** | ***SAL\_***  ***MIN (%)*** | ***SAL\_***  ***MAX (%)*** | ***SAL\_***  ***MOD (%)*** | ***Description*** |
|  | 1 | 0 | 0.04 | Refer comment under ‘Item values & Interpretation’ | Very low |
|  | 2 | 0.05 | 0.14 | Low |
|  | 3 | 0.15 | 0.29 | Medium |
|  | 4 | 0.3 | 0.69 | High |
|  | 5 | 0.7 | 1 | Very high |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**6. Cation Exchange Capacity:** CEC is estimated as weighted averages for the soil profile from 0–0.6 m depth and expressed in units of centimoles of charge per kg (cmoles (+)/kg). The CEC classes are described more fully in Webb and Wilson (1995) and Blakemore *et al.* (1987).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item values:** | ***CEC\_***  ***CLASS*** | ***CEC\_***  ***MIN (cmoles(+)/kg)*** | ***CEC\_***  ***MAX (cmoles(+)/kg)*** | ***CEC\_***  ***MOD (cmoles(+)/kg)*** | ***Description*** |
|  | 1 | 40 | 100 | Refer comment under ‘Item values & Interpretation’ | Very high |
|  | 2 | 25 | 39.9 | High |
|  | 3 | 12 | 24.9 | Medium |
|  | 4 | 6 | 11.9 | Low |
|  | 5 | 0 | 5.9 | Very low |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**7. Total Carbon:** Total carbon (organic matter content) is estimated as weighted averages for the upper part of the soil profile from 0–0.2 m depth, and expressed as a percentage. The classes are described more fully in Webb and Wilson (1995) and Blakemore *et al.* (1987).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item values:** | ***CARBON\_***  ***CLASS*** | ***CARBON\_***  ***MIN (%)*** | ***CARBON\_***  ***MAX (%)*** | ***CARBON\_***  ***MOD (%)*** | ***Description*** |
|  | 1 | 20 | 60 | Refer comment under ‘Item values & Interpretation’ | Very high |
|  | 2 | 10 | 19.9 | High |
|  | 3 | 4 | 9.9 | Medium |
|  | 4 | 2 | 3.9 | Low |
|  | 5 | 0 | 1.9 | Very low |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**8. P retention:** P retention (phosphate retention) is estimated as weighted averages for the upper part of the soil profile from 0–0.2 m depth, and expressed as a percentage. The classes are described more fully in Blakemore *et al.* (1987) and Webb and Wilson (1995).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item values:** | ***PRET\_***  ***CLASS*** | ***PRET\_***  ***MIN (%)*** | ***PRET\_***  ***MAX (%)*** | ***PRET\_***  ***MOD (%)*** | ***Description*** |
|  | 1 | 85 | 100 | Refer comment under ‘Item values & Interpretation’ | Very high |
|  | 2 | 60 | 84 | High |
|  | 3 | 30 | 59 | Medium |
|  | 4 | 10 | 29 | Low |
|  | 5 | 0 | 9 | Very low |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**Item format:** Numeric fields (*\_MIN, \_MAX,* and *\_MOD*) take the format dictated by the database system

**Comments:** Character fields (*\_CLASS, \_VAR,* and *\_EST*) are left justified.

**References:** Blakemore, L. C.; Searle, P. L.; Daly, B. K. 1987: Methods for chemical analysis of soils. *New Zealand Soil Bureau Scientific Report 80.* Wellington, New Zealand, National Water and Soil Conservation Authority. 103p.

Milne, J. D. G.; Clayden, B.; Singleton, P. L.; Wilson, A. D. 1995: Soil description handbook. Manaaki Whenua Press, Lincoln, Canterbury, New Zealand. 157p.

Parfitt, R. L.1984: Reserves of nutrients in New Zealand soils. *New Zealand Soil News 32:* 123–130.

Webb, T. H.; Wilson, A. D. 1995: A manual of land characteristics for evaluation of rural land. *Landcare Research Science Series10.* Lincoln, New Zealand, Manaaki Whenua Press. 32p.

# Soil Physical Characteristics

**Description:** Polygon layer delineating land areas classified according to three key soil physical attributes, namely:

* topsoil gravel content,
* rock outcrops and surface boulders,
* particle size

**Origin:** Interpreted, for each predefined **soil** in the 1:63 360/1:50 000 scale New Zealand Land Resource Inventory survey either from reference to analytical results stored in the National Soils Database (NSD) or as professional estimates by pedologists acknowledged as authorities in the soils of the region in question.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item name(s) &**  **definition(s):** | | Topsoil gravel content and rock outcrops & surface boulders have an identical set of six items identifying a class, a minimum, maximum, and mod-value, and two items that identify the attribute variability (in terms of class intervals), and the origin of the estimate. Particle size has a single item identifying its value. ArcInfo field definitions (Item width, Output width, Type, and Number of decimals) are indicated in parentheses below their respective class name, thus: | | | |
|  | | ***Topsoil gravel content*** | ***Rock outcrops & surface boulders*** | ***Particle Size*** | |
|  | | GRAV\_CLASS  (1,1,c,-) | ROCK\_CLASS  (1,1,c,-) | PS  (5,5,c,-) | |
|  | | GRAV\_MIN  (3,3,i,-) | ROCK\_MIN  (3,3,i,-) |  | |
|  | | GRAV\_MAX  (3,3,i,-) | ROCK\_MAX  (3,3,i,-) |  | |
|  | | GRAV\_MOD  (3,3,i,-) | ROCK\_MOD  (3,3,i,-) |  | |
|  | | GRAV\_VAR  (2,2,c,-) | ROCK\_VAR  (2,2,c,-) |  | |
|  | | GRAV\_EST  (2,2,c,-) | ROCK\_EST  (2,2,c,-) |  | |

|  |  |
| --- | --- |
| **Item values & interpretation:** | Item values for each soil attribute are presented below. Interpretation of these values is implicit in the description and any explanatory notes. |

**1. \_MOD values:** Values for \_MOD are calculated for each record, as the estimated modal value for a particular class. These modal values are calculated using the class range and variability (\_VAR) and are considered to approximate the most common value. The following formula is used to calculate the modal value for records where soil factor values increase as class number rises (e.g. Gravel and Rock):

**Mod =** (Cn+Cx)/2 + (Vars ((Cx-Cn)/3))

Cn = Class minimum value

Cx = Class maximum value

Vars = Value of var not = 0 (i.e. 1+, 1-, 2+, 2-)

e.g. GRAV of class 3 with a \_VAR value of 1- is calculated as follows:

**Mod =** (15+34)/2 + (-1((34-15)/3)

**=** 18.2

**2. \_VAR values:** The variability field describes the likely distribution of measured theme values in terms of attribute classes. The field values and their meaning are as follows:

0 —Occurs mostly within the nominated class. The middle of the nominated class is a good approximation for a numerical value.

1 —Straddles the class above and below. The mean is the middle of the nominated class.

1- —Straddles this class and the class below. The mean is taken at the class boundary.

1+ —Straddles this class and the class above. The mean is taken at the class boundary.

2 —Straddles 2 classes above and below. The mean is the middle of the nominated class.

**3. \_EST values:** The estimation field describes the origin of the chosen theme value. The field values and their meaning is as follows:

m —Estimated from analyses or measurements of the named soil.

r —Estimated from relationships with other soils but this estimate is considered to be reliable.

u —Estimated from relationships with other soils but with an unknown level of accuracy.

uf —Estimated from General Soil Survey data (scale 1:253 440). In general, the quality of the estimate is less reliable than class ‘u’ above.

**4. Topsoil gravel content:** The classes originate from and are described more fully in Webb and Wilson (1995). Gravel classes and their corresponding values are as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item values:** | ***GRAV\_***  ***CLASS*** | ***GRAV\_***  ***MIN (%)*** | ***GRAV\_***  ***MAX (%)*** | ***GRAV\_***  ***MOD (%)*** | ***Description*** |
|  | 1 | 0 | 4 | Refer comment under ‘Item values & Interpretation’ | Non-gravelly to very slightly gravelly |
|  | 2 | 5 | 14 | Slightly gravelly |
|  | 3 | 15 | 34 | Moderately gravelly |
|  | 4 | 35 | 69 | Very gravelly |
|  | 5 | 70 | 100 | Extremely gravelly |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**5. Rock outcrops & surface boulders:** This collection of fields is an expression of the percentage of the area of the map units covered by rock outcrops or surface boulders. The classes originate from and are described more fully in Webb and Wilson (1995). Rock outcrop classes and their corresponding values are as follows

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item values:** | ***ROCK\_***  ***CLASS*** | ***ROCK\_***  ***MIN (%)*** | ***ROCK\_***  ***MAX (%)*** | ***ROCK\_***  ***MOD (%)*** | ***Description*** |
|  | 1 | 0 | 0 | Refer comment under ‘Item values & Interpretation’ | Non-rocky |
|  | 2 | 0 | 1 | Slightly rocky |
|  | 3 | 2 | 9 | Moderately rocky |
|  | 4 | 10 | 24 | Very rocky |
|  | 5 | 25 | 60 | Extremely rocky |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**6. Particle Size Class:** The classes are described in Webb and Wilson (1995). Particle size classes are as follows:

|  |  |  |
| --- | --- | --- |
| **Item values:** | PS | Description |
|  | K | Skeletal |
|  | S | Sandy |
|  | L | Loamy |
|  | Z | Silty |
|  | C | Clayey |
|  | Ts | Sandy peat or sandy litter, organic matter 30-50%, sand in mineral fraction > 50% |
|  | Tl | Loamy peat or loamy litter, organic matter 30-50%, sand in mineral fraction < 50% |
|  | Tp | Peat or litter, organic matter > 50% |
|  | undef | Undefined |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**Item format:** Numeric fields (\_MIN, \_MAX, and *\_MOD*) take the format dictated by the database system

Character fields (*\_CLASS, \_VAR, \_EST and PS*) are left justified.

**Interpretation:** Particle Size Examples: - S denotes sandy

- K/S denotes skeletal over sandy

**Comments:** Particle size class describes in broad terms the proportions of sand, silt and

clay in the fine earth fraction of the soil except in the case of skeletal soils

( > 35% coarse fraction ) where it applies to the whole soil.

The user should also refer to the item grav\_class for a description of the

topsoil gravel content of soils.

For the 2nd Edition Gisborne—East Coast mapping particle size is recorded

as undefined as soils were mapped directly to the New Zealand Soil

Classification

**References:** Webb, T. H., Wilson, A. D. 1995: A manual of land characteristics for evaluation of rural land. *Landcare Research Science Series 10*. Lincoln, New Zealand, Manaaki Whenua Press. 32p.

# Soil Drainage Parameters

**Description:** Polygon layer delineating land areas classified according to key soil drainage parameters relevant to plant growth, namely:

* potential rooting depth,
* depth to a slowly permeable horizon,
* soil drainage class (hydromorphic class),
* permeability

**Origin:** Interpreted, for each predefined **soil** in the 1:63 360/1:50 000 scale New Zealand Land Resource Inventory survey either from reference to analytical results stored in the National Soils Database (NSD) or as professional estimates by pedologists acknowledged as authorities in the soils of the region in question.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Item name(s) & definition(s):** | | Potential rooting depth and Depth to a slowly permeable horizon each have an identical set of six items identifying a class, a minimum, maximum, and mod-value, and two items that identify the attribute variability (in terms of class intervals), and the origin of the estimate. Soil drainage, being primarily a classification based on assessment of field characteristics, does not have the minimum, maximum, and mod-value items. Permeability has a single item identifying its value. ArcInfo field definitions (Item width, Output width, Type, and Number of decimals) are indicated in parentheses below their respective class name, thus: | | | | |
|  | | ***Potential rooting depth*** | ***Depth to a slowly permeable horizon*** | ***Drainage class*** | ***Permeability*** | |
|  | | PRD\_CLASS  (1,1,c,-) | DSLO\_CLASS  (1,1,c,-) | DRAIN\_CLASS  (1,1,c,-) | PERMEABILITY  (4,4,c,-) | |
|  | | PRD\_MIN  (4,4,n,2) | DSLO\_MIN  (4,4,n,2) |  |  | |
|  | | PRD\_MAX  (4,4,n,2) | DSLO\_MAX  (4,4,n,2) |  |  | |
|  | | PRD\_MOD  (4,4,n,2) | DSLO\_MOD  (4,4,n,2) |  |  | |
|  | | PRD\_VAR  (2,2,c,-) | DSLO\_VAR  (2,2,c,-) | DRAIN\_VAR  (2,2,c,-) |  | |
|  | | PRD\_EST  (2,2,c,-) | DSLO\_EST  (2,2,c,-) | DRAIN\_EST  (2,2,c,-) |  | |

|  |  |
| --- | --- |
| **Item values & interpretation:** | Item values for each soil attribute are presented below. Interpretation of these values is implicit in the description and any explanatory notes. |

**1. \_MOD values:** Values for \_MOD are calculated for each record, as the estimated modal value for a particular class. These modal values are calculated using the class range and variability (\_VAR) and are considered to approximate the most common value. The formula differs between soil factors whose values decrease with class number (e.g. DSLO) and factors whose values increase with class number (e.g. PRD), as follows:

Where factor values decrease as class number rises

**Mod =** (Cn+Cx)/2 - (Vars ((Cx-Cn)/3))

Cn = Class minimum value

Cx = Class maximum value

Vars = Value of var not = 0 (i.e. 1+, 1-, 2+, 2-)

e.g. a PRD of class 3 with a \_VAR value of 1- is calculated as follows:

**Mod =** (0.6+0.89)/2 - (-1((0.89-0.6)/3)

**=** 0.842

Where factor values increase as class number rises

**Mod =** (Cn+Cx)/2 + (Vars ((Cx-Cn)/3))

e.g. a DSLO of class 2 with a \_VAR value of 1- is calculated as follows:

**Mod =** (0.45+0.59)/2 + (-1((0.59-0.45)/3)

= 0.473

**2. \_VAR values:** The variability field describes the likely distribution of measured theme values in terms of attribute classes. The field values and their meaning are as follows:

0 —Occurs mostly within the nominated class. The middle of the nominated class is a good approximation for a numerical value.

1 —Straddles the class above and below. The mean is the middle of the nominated class.

1- —Straddles this class and the class below. The mean is taken at the class boundary.

1+ —Straddles this class and the class above. The mean is taken at the class boundary.

2 —Straddles 2 classes above and below. The mean is the middle of the nominated class.

**3. \_EST values:** The estimation field describes the origin of the chosen theme value. The field values and their meaning is as follows:

m —Estimated from analyses or measurements of the named soil.

r —Estimated from relationships with other soils but this estimate is considered to be reliable.

u —Estimated from relationships with other soils but with an unknown level of accuracy.

uf —Estimated from General Soil Survey data (scale 1:253 440). In general, the quality of the estimate is less reliable than class ‘u’ above.

**4. Potential rooting depth:** Potential rooting depth describes the minimum and maximum depths (in metres) to a layer that may impede root extension. Such a layer may be defined by penetration resistance, poor aeration or very low available water capacity. These classes, described more fully in Webb and Wilson (1995), are as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item values:** | ***PRD\_***  ***CLASS*** | ***PRD\_***  ***MIN (m)*** | ***PRD\_***  ***MAX (m)*** | ***PRD\_***  ***MOD (m)*** | ***Description*** |
|  | 1 | 1.2 | 1.5 | Refer comment under ‘Item values & Interpretation’ | Very deep |
|  | 2 | 0.9 | 1.19 | Deep |
|  | 3 | 0.6 | 0.89 | Moderately deep |
|  | 4 | 0.45 | 0.59 | Slightly deep |
|  | 5 | 0.25 | 0.44 | Shallow |
|  | 6 | 0.15 | 0.24 | Very shallow |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**5. Depth to a slowly permeable horizon:** Depth to a slowly permeable horizon describes the minimum and maximum depths (in metres) to a horizon in which the permeability is less than 4mm/hr as measured by techniques outlined in Griffiths (1985). If no slowly permeable horizon is observed, the taxon is allocated to Class 6 and a null value with numeric code -.99 is entered into the data fields. These classes, described more fully in Webb and Wilson (1995), are as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item values:** | ***DSLO\_***  ***CLASS*** | ***DSLO\_***  ***MIN (m)*** | ***DSLO\_***  ***MAX (m)*** | ***DSLO\_***  ***MOD (m)*** |
|  | 1 | 0 | 0.44 | Refer comment under ‘Item values & Interpretation’ |
|  | 2 | 0.45 | 0.59 |
|  | 3 | 0.6 | 0.89 |
|  | 4 | 0.9 | 1.19 |
|  | 5 | 1.2 | 1.49 |
|  | 6 | ‑0.99 | ‑0.99 |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**6. Soil drainage class:** Soil drainage is described as a class. Drainage classes are assessed using criteria of soil depth and duration of water tables inferred from soil colours and mottles, as in the following table or from reference to diagnostic horizons, as described below this table. Drainage classes used here are the same as those used in the NZ Soil Classification (Hewitt 1993), and outlined by Milne *et al.* (1995). The drainage classes with their descriptions are as follows:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Item values:** | **DRAIN\_CLASS** | **Description** | **Depth below A horizon**  **(cm)** | **Depth from surface**  **(cm)** | **Low chroma on ped or cut surfaces (%)** | **High Chroma**  **Redox mottles (%)** |
|  | 1 | Very poor | 1 | ≤10 | ≥50 |  |
|  | 2 | Poor | ≤15 | ≤30 | ≥50 |  |
|  | 3 | Imperfect | ≤15 | ≤30 | ≤50 | and/or ≥2 |
|  |  |  | >15 | 30–90 | ≥50 |  |
|  | 4 | Moderately well |  | 30–90 |  | ≥2 |
|  |  |  |  | 60–90 | ≥50 |  |
|  | 5 | Well |  | <90 |  | <2 |

1 To qualify for very poorly drained the profile must have a 0 horizon in place of the A horizon, and lack a distinct topsoil.

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

|  |  |  |
| --- | --- | --- |
|  | Key to drainage classes using the diagnostic horizons and features of the New Zealand Soil Classification Hewitt (1993) | |
|  | Drainage Class 1 | Soils have an 0 horizon in place of the A horizon, & lack a distinct topsoil |
|  | Drainage Class 2 | Soils that have a gley profile form |
|  | Drainage Class 3 | Soils that have a mottled profile form |
|  | Drainage Class 4 | Soils that have either a reductimorphic horizon between 60 and 90 cm, or a redox-mottled horizon between 30 cm and 90 cm. |
|  | Drainage Class 5 | Soils that do not have a redox mottled horizon at less than 90 cm |

**7. Permeability profile:** Permeability is the rate that water moves through saturated soil. The permeability of a soil profile is related to potential rooting depth, depth to a slowly permeable horizon and internal soil drainage. Permeablity classes are from Clayden and Webb (1994). Permeability values are as follows:

|  |  |  |
| --- | --- | --- |
| **Item values:** | ***Permeability*** | ***Description*** |
|  | S | Slow |
|  | M | Moderate |
|  | R | Rapid |
|  | NA | Not applicable |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**Item format:** Numeric fields (*\_MIN, \_MAX,* and *\_MOD*) take the format dictated by the database system

Character fields (*\_CLASS, \_VAR, \_EST* and *PERMEABILITY*) are left justified.

**Interpretation:** Permeability examples: - S denotes slow permeability

- M/R denotes moderate over rapid

permeability in layered soils.

**Comments:**

**References:** Clayden, B., Webb, T. H. 1994: Criteria for defining the soil form – the fourth category of the New Zealand Soil Classification. *Landcare Research Science Series 3*. Lincoln, New Zealand, Manaaki Whenua Press. 36p

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Webb, T. H., Wilson, A. D. 1995: A manual of land characteristics for evaluation of rural land. *Landcare Research Science Series 10*. Lincoln, New Zealand, Manaaki Whenua Press. 32p

# Soil Environment Parameters

**Description:** Polygon layer delineating land areas classified according to two key soil physical attributes:

* flood return interval,
* soil temperature regime (0.3m depth)

**Origin:** Interpreted, for each predefined **soil** in the 1:63 360/1:50 000 scale New Zealand Land Resource Inventory survey either from reference to analytical results stored in the National Soils Database (NSD) or as professional estimates by pedologists acknowledged as authorities in the soils of the region in question.

|  |  |  |
| --- | --- | --- |
| **Item name(s) & definition(s):** | Each soil attribute has an identical set of three items identifying first, a class, and second, two items that identify the attribute variability (in terms of class intervals) and the origin of the estimate. ArcInfo field definitions (Item width, Output width, Type, and Number of decimals) are indicated in parentheses below their respective class name, thus: | |
|  | ***Flood return interval*** | ***Soil temperature regime (0.3m depth)*** |
|  | FLOOD\_CLASS  (1,1,c,-) | TEMP\_CLASS  (1,1,c,-) |
|  | FLOOD\_VAR  (2,2,c,-) | TEMP\_VAR  (2,2,c,-) |
|  | FLOOD\_EST  (2,2,c,-) | TEMP\_EST  (2,2,c,-) |

|  |  |
| --- | --- |
| **Item values & interpretation:** | Item values for each soil attribute are presented below. Interpretation of these values is implicit in the description and any explanatory notes. |

**1. \_VAR values:** The variability field describes the likely distribution of measured theme values in terms of attribute classes. The field values and their meaning is as follows:

0 —Occurs mostly within the nominated class. The middle of the nominated class is a good approximation for a numerical value.

1 —Straddles the class above and below. The mean is the middle of the nominated class.

1- —Straddles this class and the class below. The mean is taken at the class boundary.

1+ —Straddles this class and the class above. The mean is taken at the class boundary.

2 —Straddles 2 classes above and below. The mean is the middle of the nominated class.

**2. \_EST values:** The estimation field describes the origin of the chosen theme value. The field values and their meaning is as follows:

m —Estimated from analyses or measurements of the named soil.

r —Estimated from relationships with other soils but this estimate is considered to be reliable.

u —Estimated from relationships with other soils but with an unknown level of accuracy.

uf —Estimated from General Soil Survey data (scale 1:253 440). In general, the quality of the estimate is less reliable than class ‘u’ above.

**3. Flood return interval:** The classes originate from and are described more fully in Webb and Wilson (1995). Flood return interval classes and their corresponding values, are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| **Item values:** | ***FLOOD\_***  ***CLASS*** | ***Description*** | ***Flood return interval (years)*** |
|  | 1 | Nil | Nil |
|  | 2 | Slight | <1 in 60 |
|  | 3 | Moderate | 1 in 20–1 in 60 |
|  | 4 | Moderately severe | 1 in 10–1 in 20 |
|  | 5 | Severe | 1 in 5–1 in 10 |
|  | 6 | Very severe | >1 in 5 |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**4. Soil temperature regime:** The soil temperature regime classes relate to the soil temperature at 0.3 m depth. The classes used originate from and are described more fully in Webb and Wilson (1995), which in turn is based on the work of Aldridge (1982, 1984) and Aldridge and Cook (1983). The classes and their corresponding characteristics, are as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item values:** | ***TEMP\_***  ***CLASS*** | ***Description*** | | | |
|  |  | **Soil temperature regime** | **Mean annual soil temperature (0C)** | **Period <50C (days)** | **Period >200C (days)** |
|  | T | Thermic | 15–22 | 0 | n/a |
|  | WM | Warm mesic | 11–15 | 0 | >5 |
|  | MM | Mild mesic | 11–15 | <60 | 0 |
|  | CM | Cool mesic | 8–11 | <60 | 0 |
|  | DM | Cold mesic | 8–11 | >60 | 0 |
|  | C | Cryic1 | <8 | >60 | 0 |

1 Mean summer temperature < 15OC

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**Item format:** Character fields (*\_CLASS, \_VAR,* and *\_EST*) are left justified.

**Comments:**

**References:** Aldridge, R. 1982: The prediction of soil temperature in New Zealand and application to temperature regimes of soil taxonomy. *New Zealand Soil Bureau Scientific Report 54.* 23p.

Aldridge, R. 1984: Proposal for New Zealand soil temperature regimes. *New Zealand Soil Bureau Soil Resources Report SR4.* 12p.

Aldridge, R.; Cook, F. J. 1983: Estimation of soil temperatures at 0.1 m and 0.3 m depths. *New Zealand Soil Bureau Scientific Report 62.* 18p.

Webb, T. H.; Wilson, A. D. 1995: A manual of land characteristics for evaluation of rural land. *Landcare Research Science Series 10*. Lincoln, New Zealand, Manaaki Whenua Press. 32p.

# Soil Moisture Properties

**Description:** Polygon layer delineating land areas classified according to four key soil physical attributes:

* profile total available water
* profile readily available water
* macroporosity (0–0.6 m depth)
* macroporosity (0.6–0.9 m depth)

**Origin:** Interpreted, for each predefined **soil** in the 1:63 360/1:50 000 scale New Zealand Land Resource Inventory survey either from reference to analytical results stored in the National Soils Database (NSD) or as professional estimates by pedologists acknowledged as authorities in the soils of the region in question.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item name(s) & definition(s):** | Each soil attribute has an identical set of six items identifying a class, a minimum, maximum, and mod-value, and two items that identify the attribute variability (in terms of class intervals) and the origin of the estimate. ArcInfo field definitions (Item width, Output width, Type, and Number of decimals) are indicated in parentheses below their respective class name, thus: | | | |
|  | ***Profile total available water*** | ***Profile readily available water*** | ***Macroporosity***  ***(0–0.6 m depth)*** | ***Macroporosity***  ***(0.6–0.9 m depth)*** |
|  | PAW\_CLASS  (1,1,c,-) | PRAW\_CLASS  (1,1,c,-) | MPOR\_S\_CLASS  (1,1,c,-) | MPOR\_D\_CLASS  (1,1,c,-) |
|  | PAW\_MIN  (3,3,i,-) | PRAW\_MIN  (3,3,i,-) | MPOR\_S\_MIN  (4,4,n,1) | MPOR\_D\_MIN  (4,4,n,1) |
|  | PAW\_MAX  (3,3,i,-) | PRAW\_MAX  (3,3,i,-) | MPOR\_S\_MAX  (4,4,n,1) | MPOR\_D\_MAX  (4,4,n,1) |
|  | PAW\_MOD  (3,3,i,-) | PRAW\_MOD  (3,3,i,-) | MPOR\_S\_MOD  (4,4,n,1) | MPOR\_D\_MOD  (4,4,n,1) |
|  | PAW\_VAR  (2,2,c,-) | PRAW\_VAR  (2,2,c,-) | MPOR\_S\_VAR  (2,2,c,-) | MPOR\_D\_VAR  (2,2,c,-) |
|  | PAW\_EST  (2,2,c,-) | PRAW\_EST  (2,2,c,-) | MPOR\_S\_EST  (2,2,c,-) | MPOR\_D\_EST  (2,2,c,-) |

|  |  |
| --- | --- |
| **Item values & interpretation:** | Item values for each soil attribute are presented below. Interpretation of these values is implicit in the description and any explanatory notes. |

**1. \_MOD values:** Values for \_MOD are calculated for each record, as the estimated modal value for a particular class. These modal values are calculated using the class range and variability (\_VAR) and are considered to approximate the most common value. The following formula is used to calculate the modal value for records where soil values decrease as class number rises (e.g. PAW, PRAW, MPORS, MPORD);

**Mod =** (Cn+Cx)/2 - (Vars ((Cx-Cn)/3))

Cn = Class minimum value

Cx = Class maximum value

Vars = Value of var not = 0 (i.e. 1+, 1-, 2+, 2-)

e.g. a PAW of class 3 with a \_VAR value of 1- is calculated as follows:

**Mod =** (90+149)/2 - (-1((149-90)/3)

**=** 139.2

**2. \_VAR values:** The variability field describes the likely distribution of measured theme values in terms of attribute classes. The field values and their meaning is as follows:

0 —Occurs mostly within the nominated class. The middle of the nominated class is a good approximation for a numerical value.

1 —Straddles the class above and below. The mean is the middle of the nominated class.

1- —Straddles this class and the class below. The mean is taken at the class boundary.

1+ —Straddles this class and the class above. The mean is taken at the class boundary.

2 —Straddles 2 classes above and below. The mean is the middle of the nominated class.

**3. \_EST values:** The estimation field describes the origin of the chosen theme value. The field values and their meaning is as follows:

m —Estimated from analyses or measurements of the named soil.

r —Estimated from relationships with other soils but this estimate is considered to be reliable.

u —Estimated from relationships with other soils but with an unknown level of accuracy.

uf —Estimated from General Soil Survey data (scale 1:253 440). In general, the quality of the estimate is less reliable than class ‘u’ above.

**4. Profile total available water:** PAW\_CLASS is a classification of profile total available water for the soil profile to a depth of 0.9 m, or to the potential rooting depth (whichever is the lesser). Values are weighted averages over the specified profile section (0–0.9 m) and are expressed in units of mm of water. The classes originate from the work of Gradwell and Birrell (1979), Wilson and Giltrap (1982) and Griffiths (1985), and are described more fully in Webb and Wilson (1995). Profile total available water classes and their corresponding values are as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item values:** | ***PAW\_***  ***CLASS*** | ***PAW\_***  ***MIN (mm)*** | ***PAW\_***  ***MAX (mm)*** | ***PAW\_***  ***MOD (mm)*** | ***Description*** |
|  | 1 | 250 | 350 | Refer comment under ‘Item values & Interpretation’ | Very high |
|  | 2 | 150 | 249 | High |
|  | 3 | 90 | 149 | Moderately high |
|  | 4 | 60 | 89 | Moderate |
|  | 5 | 30 | 59 | Low |
|  | 6 | 0 | 29 | Very low |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**5. Profile readily available water:** PRAW\_CLASS is a classification of profile readily available water for the soil profile to a depth of 0.9 m, or to the potential rooting depth (whichever is the lesser). Values are weighted averages over the specified profile section (0–0.9 m) and are expressed in units of mm of water. The classes originate from the work of Gradwell and Birrell (1979), Wilson and Giltrap (1982) and Griffiths (1985), and are described more fully in Webb and Wilson (1995). Profile readily available water classes and their corresponding values are as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item values:** | ***PRAW\_***  ***CLASS*** | ***PRAW\_***  ***MIN (mm)*** | ***PRAW\_***  ***MAX (mm)*** | ***PRAW\_***  ***MOD (mm)*** | ***Description*** |
|  | 1 | 150 | 250 | Refer comment under ‘Item values & Interpretation’ | Very high |
|  | 2 | 100 | 149 | High |
|  | 3 | 75 | 99 | Moderately high |
|  | 4 | 50 | 74 | Moderate |
|  | 5 | 25 | 49 | Low |
|  | 6 | 0 | 24 | Very Low |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**6. Macroporosity (0–0.6 m):** Macroporosity is an expression of the air-filled porosity of the soil at ‘field capacity’. Values are minimum values over the specified profile section (0–0.6 m), and are expressed as a percentage of the soil volume. The classes originate from the work of Gradwell (1960) and Gradwell and Birrell (1979), and are described more fully in Webb and Wilson (1995). Macroporosity classes and their corresponding values are as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item values:** | ***MPOR\_S\_***  ***CLASS*** | ***MPOR\_S\_***  ***MIN (%)*** | ***MPOR\_S\_***  ***MAX (%)*** | ***MPOR\_S\_***  ***MOD (%)*** | ***Description*** |
|  | 1 | 15 | 25 | Refer comment under ‘Item values & Interpretation’ | Very high |
|  | 2 | 10 | 14.9 | High |
|  | 3 | 7.5 | 9.9 | Moderate |
|  | 4 | 5 | 7.4 | Low |
|  | 5 | 0 | 4.9 | Very low |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**7. Macroporosity (0.6–0.9 m):** Macroporosity is an expression of the air-filled porosity of the soil at ‘field capacity’. Values are minimum values over the specified profile section (0.6–0.9 m), and are expressed as a percentage of the soil volume. The classes originate from the work of Gradwell (1960) and Gradwell and Birrell (1979), and are described more fully in Webb and Wilson (1995). Macroporosity classes and their corresponding values are as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item values:** | ***MPOR\_D\_***  ***CLASS*** | ***MPOR\_D\_***  ***MIN (%)*** | ***MPOR\_D\_***  ***MAX (%)*** | ***MPOR\_D\_***  ***MOD (%)*** | ***Description*** |
|  | 1 | 15 | 25 | Refer comment under ‘Item values & Interpretation’ | Very high |
|  | 2 | 10 | 14.9 | High |
|  | 3 | 7.5 | 9.9 | Moderate |
|  | 4 | 5 | 7.4 | Low |
|  | 5 | 0 | 4.9 | Very low |

The ArcInfo ‘world polygon’ has a null value, otherwise all records contain values from the list above.

**Item format:** Numeric fields ( *\_MIN, \_MAX,* and *\_MOD*) take the format dictated by the database system

Character fields (*\_CLASS,* *\_VAR,* and *\_EST*) are left justified.

**Comments:**

**References:** Gradwell, M. W. 1960: Changes in the pore‑space of a pasture topsoil under animal treading. *New Zealand Journal of Agricultural Research 3*: 663–74.

Gradwell, M. W.; Birrell, K. S. 1979: Soil Bureau laboratory methods. Part C: Methods for physical analysis of soils. *New Zealand Soil Bureau Scientific Report 10C.*

Griffiths, E. 1985: Interpretation of soil morphology for assessing moisture movement and storage. *New Zealand Soil Bureau Scientific Report 74*. 20p.

Wilson, A.D; Giltrap, D.J. 1982: Prediction and mapping of soil water retention properties. *New Zealand Soil Bureau District Office Report WN7.* 15p.

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# Appendix 1. Correlation between Lithology 2nd Edition (rock2) and 1st Edition (rock).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ***‘rock2' code (Ed2)*** | ***Rock type class*** | ***‘rock’ code (Ed1)*** | | ***‘rock2' code (Ed2)*** | ***Rock type class*** | ***‘rock’ code (Ed1)*** | |
|  |  | ***NI*** | ***SI*** |  |  | ***NI*** | ***SI*** |
| **Igneous Rocks: (i) extremely weak to weak** | | | | | | | |
| Ng | Ngauruhoe tephra | Ng | - | Rm | Rotomahana mud | Rm | - |
| Ta | Tarawera tephra | Ta | - | Sc | Scoria | Sc | - |
| Lp | Pumiceous lapilli | Lp | - | Kt | Kaharoa & Taupo ashes | Kt | - |
| Tp | Taupo & Kaharoa breccia & pumiceous alluvium | Tp | - | Mo | Ashes older than Taupo ash | Mo | - |
| Ft | Quaternary breccias older than Taupo breccia | Ft | - | La | Lahar deposits | La | - |
| Vu | Extremely weak altered volcanics | Vu | - |  |  |  |  |
| **Igneous Rocks: (ii) weak to extremely strong** | | | | | | | |
| Vo | Lavas & welded ignimbrites | ptVo | ptVo | Tb | Indurated fine-grained pyroclastics | ptCg | ptTb |
| Vb | Indurated volcanic breccias | ptCg | ptTb, ptVo | In | Ancient volcanics | ptVo | In |
| Gn | Plutonics | Gn | Gn | Um | Ultramafics | Um | Um |
| **Sedimentary Rocks: (i) very loose to compact (very soft to stiff)** | | | | | | | |
| Pt | Peat | Pt | Pt | Lo | Loess | Lo | Lo |
| Wb | Windblown sand | Wb | Wb | Af | Fine alluvium | Al | ptAl |
| Gr | Alluvium gravels | ptGr | ptAl | Cl | Coarse slope deposits | ptGr | ptAl |
| Gl | Glacial till | - | ptAl | Uf | Unconsolidated clays & silts | ptUs | - |
| Us | Unconsolidated sands & gravels | ptUs | - |  |  |  |  |
| **Sedimentary Rocks: (ii) very compact (very stiff) to weak** | | | | | | | |
| Mm | Massive mudstone | Mm | ptMs | Mb | Bedded mudstone | Mb | ptFy, ptMs |
| Mf | Frittered mudstone or jointed mudstone | ptMj | ptMs | Me | Bentonitic mudstone | Me | ptMs |
| Sm | Massive sandstone | ptSm | Ss | Sb | Bedded sandstone | ptSb | ptFy, ptSs |
| Cw | Weakly consolidated conglomerate | ptGr | Cw | Mx | Sheared mixed lithologies | ptMj, ptSb, ptSm, ptAc | ptMs |
| Ac | Crushed argillite association of rocks | ptAc | Ar |  |  |  |  |
| **Sedimentary Rocks: (iii) moderately strong to extremely strong** | | | | | | | |
| Ar | Argillite | ptAr | ptAr | Si | Indurated sandstone | ptSm, ptGw | Hs |
| Cg | Conglomerate & breccia | ptCg, ptGw | Cg | Gw | Greywacke association of rocks | PtGw, ptAr | ptGw, ptAr |
| Li | Limestone | Li | Ls |  |  |  |  |
| **Metamorphic Rocks** | | | | | | | |
| Sx | Semi-schist | ptGw | St1 | Sy | Schist | - | St2 |
| Gs | Gneiss | - | Gs | Ma | Marble | - | Ma |

# Appendix 2. Reference to soil surveys underpinning LRIS spatial data layers

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **‘surcode’** | **‘survey’** | **short reference** | **Island** | **NZLRI reference** |
| AHIP | Ahipara‑Herekino Area | Cox, J.E. *et al.* 1983: Northland Peninsula soil survey, scale 1:100 000. | N | K |
| ALX | Alexandra District | McCraw, J.D., 1964: Soils of Alexandra District, scale 1:15 840. | S | i |
| AWAV | Lower Awatere Valley | Campbell, I.C., 1987: Soil map of Lower Awatere Valley, New Zealand (unpublished), scale 1:15 000. | S | y |
| AWOP | Awhea and Opouawe Catchments | Gibbs, H.S. (unpublished): Provisional soil map Awhea and Opouawe Catchments. | N | F |
| BAYI | Bay of Islands Area | Cox, J.E. et al. 1983: Northland Peninsula soil survey, scale 1:100 000. | N | K |
| BLRE | Blenheim-Renwick District | Laffan, M.D., Vincent, K.W., 1990: Soils of the Blenheim ‑ Renwick district. In: Rae, S.N., Tozer, C.G. (*eds.*) Water and Soil Resources of the Wairau, scale 1:50 000. | S | x |
| CHCH | Christchurch Region | Raeside, J.D., Rennie, W.F., 1974: Soils of Christchurh Region, New Zealand: the soil factor in regional planning, scale 1:63 360. | S | d |
| CNO | Canterbury and North Otago, Plains and Downs | Kear, B.S., Gibbs, H.S., Miller, R.B., 1967: Soils of the downs and plains, Canterbury, North Otago, New Zealand, scale 1:126 720. | S | c |
| CORO | Coromandel‑Thames | McCraw, J.D. 1972: Coromandel Thames Soils. Land Inventory County Series, scale 1:126 720. | N | j |
| EGPT | Egmont & part Taranaki Counties | Palmer, R.W.P. et al. 1981: Soils of Egmont and part Taranaki Counties, scale 1:50 000. | N | w |
| ELSM | Ellesmere County | Ward, W.T., Harris, C.S., Schapper, H.P., 1964: Soils and agriculture of Ellesmere County, Canterbury, New Zealand, scale 1:31 680. | S | e |
| FRAN | Franklin County (part) | Orbell, G.E. 1977: Soils of part Franklin County, scale 1:63 360. | N | E |
| GEC | Gisborne ‑ East Coast region. | Jessen, M.R., Crippen, T.F., Page, M.J., Rijkse, W.C., Harmsworth, G.R., McLeod, M. 1999: Land use capability classification of the Gisborne ‑ East Coast region. | N | @ |
| GIK | Green Island ‑ Kaitangata | Wright, A.C.S., Richards, J., Lobb, W.R., Miller, R.B., 1952: Soils and their utilisation. Green Island ‑ Kaitangata District, scale 1:63 360. | S | o |
| GISP | Gisborne Plains | Pullar, W.A. 1962: Soils of Gisborne Plains, scale 1:15 840. | N | e |
| GRBA | Great Barrier Island | Taylor, N.H. 1954: Provisional soil map of Great Barrier Island, scale 1:63 360. | N | c |
| HELN | Helensville‑Waitakere Area, Part | Cox, J.E. *et al.* 1983: Northland Peninsula soil survey, scale 1:100 000. | N | K |
| HERP | Heretaunga Plains | Hughes, H.A. *et al.* 1939: Soil survey of Heretaunga Plains, scale 1:23 760. | N | a |
| HKNU | Hukerenui‑Whangarei Area | Cox, J.E. *et al.* 1983: Northland Peninsula soil survey, scale 1:100 000. | N | K |
| HKPU | Hauraki Plains | McLeod, M. (unpublished): Soil map of Hauraki Plains, scale 1:50 000. | N | D |
| HO | Horowhenua County | Gibbs, H.S. 1957 (unpublished): Provisional soil map of Horowhenua County, scale 1:63 360. | N | u |
| IDA | Ida Valley | McCraw, J.D., Ward, W.T., Leamy, M.L., 1966: Soil map of Ida Valley, Central Otago, South Island, New Zealand, scale 1:31 680. | S | g |
| INAN | Inangahua Depression | Mew, G., Webb, T.H., Ross, C.W., Adams, J.A., 1975: Soils of the Inangahua Depression, South Island, New Zealand, scale 1:63 360. | S | b |
| KAIR | Kairanga County | Cowie, J.D. 1978: Soils and agriculture of Kairanga County, scale 1:63 360. | N | k |
| KARA | Kaitaia‑Rawene Area | Cox, J.E. *et al.* 1983: Northland Peninsula soil survey, scale 1:100 000. | N | K |
| KING | King Country | Rijkse, W.C. *et al.* 1977: Provisional soil map of King Country, scale 1:63 360. | N | q |
| KOWI | Kowai County | Fox, J.P., Gibbs., H.S., Milne, R.A., 1964: Soils and agriculture of Kowai County, Canterbury, New Zealand, scale 1:126 720. | S | s |
| KSGB | Kaingaroa State Forest, Galatea Basin | Vucetich, C.G. *et al.* 1960: Soils of the Northern part, Kaingaroa State Forest and the Galatea Basin. scale 1:31 680. | N | H |
| LCL | Lower Clutha Plains | Butler, E.J.B., Richards, J., Collie, T.W., 1957: Soils of the Lower Clutha Plains, 1957, scale 1:31 680. | S | p |
| MADA | Mangakahia‑Dargaville Area | Cox, J.E. *et al.* 1983: Northland Peninsula soil survey, scale 1:100 000. | N | K |
| MAKA | Maungaturoto‑Kaipara Area | Cox, J.E. *et al.* 1983: Northland Peninsula soil survey, scale 1:100 000. | N | K |
| MANC | Manawatu County | Cowie, J.D. *et al.* 1977: Soils of Manawatu County, scale 1:63 360. | N | p |
| MANK | Manukau City | Purdie, B.R. *et al.* 1981 (unpublished): Manukau City soil survey, scale 1:50 000. | N | Q |
| MATC | Matakaoa County | Gibbs, H.S., 1954: Soils of Matakaoa County, scale 1:126 720. | N | d |
| MAWA | Mangawhai‑Warkworth Area | Cox, J.E. *et al.* 1983: Northland Peninsula soil survey, scale 1:100000. | N | K |
| MHKB | Mid Hawkes Bay | Pohlen, I.J. *et al.* 1947: Soils of Mid Hawkes Bay, scale 1:95 040. | N | b |
| MMN | Mid‑Manuherikia Basin | Orbell, G.E., 1974: Soils and land use of Mid Manuherikia Valley, Central Otago, New Zealand, scale 1:31 680. | S | h |
| MRSC | Manawatu‑Rangitikei Sand Country | Cowie, J.D. *et al.* 1967: Soils of the Manawatu‑Rangitikei Sand Country, scale 1:63 360. | N | g |
| MSNP | Miscellaneous National Park | Soils recorded but not part of a survey. | N | S |
| MSTA | Miscellaneous Taranaki | Soils recorded but not part of a survey. | N | R |
| MTO | Maniototo Plains | Raeside, D., Cutler, E.J.B., Miller, R.B., 1966: Soils and related irrigation problems of part Maniototo Plains, Otago, scale 1:63 360. | S | j |
| NAP | North Auckland | Taylor, N.H. *et al.* 1947: Provisional soil map of North Auckland, scale 1:63 360. | N | B |
| NCPE | North Cape‑Houhora Area | Cox, J.E. *et al.* 1983: Northland Peninsula soil survey, scale 1:100 000. | N | K |
| NI4M | NORTH ISLAND FOUR MILE | New Zealand Soil Bureau, 1954: General Survey of the Soils of North Island, scale 1:253 440. | N | 0 |
| NRTH | Northland and North Auckland 1 | Cox, J.E. *et al.* 1983: Northland Peninsula soil survey, scale 1:100 000. | N | K |
| OHIN | Ohinemuri County | McCraw, J.D. 1968: Ohinemuri Soils. Land Inventory County Series, scale 1:63 360. | N | h |
| OTAK | Otaki District | Palmer, A.S., Wilde, R.H. 1990 (unpublished): Otaki District Soil Resources Study, scale 1:15 000. | N | P |
| PAPC | Paparua County | Cox, J.E., 1978: Soils and agriculture of part Paparua County, Canterbury, New Zealand, scale 1:31 680. | S | q |
| PIAK | Piako County | Wilson, A.D. 1980: Soils of Piako County, scale 1:63 360. | N | z |
| POHA | Pohangina County | Rijkse, W.C. 1977: Soils of Pohangina County, scale 1:63 360. | N | r |
| PRTH | Port Hills and Adjacent Plains | Griffiths, E., 1974: Soils of part of the Port Hills and adjacent plains, Canterbury, New Zealand, scale 1:31 680. | S | r |
| RAGC | Raglan County | Bruce, J.G. 1978: Soils of part Raglan County, scale 1:63 360. | N | y |
| RAGN | Raglan County North (provisional) | Bruce, J.G. 1978: Soils of part Raglan County, scale 1:63 360. | N | y |
| RANG | Rangitikei County | Campbell, I.B. 1979: Soils of Rangitikei County, scale 1:63 360. | N | N |
| RERE | Rerewhakaitu District | Vucetich, C.G. *et al.* 1974: Soils of Rerewhakaaitu District, scale 1:31 680. | N | I |
| ROX | Roxburgh District | Leamy, M.L., Wilde, R.H., 1972: Soils of Roxburgh District, Central Otago, New Zealand, scale 1:63 360. | S | k |
| RTLD | Rotorua Lakes District | Rijkse, W.C. 1979: Soils of Rotorua lakes District, scale 1:50 000. | N | J |
| RURO | Ruawai‑Rototuna Area | Cox, J.E. *et al.* 1983: Northland Peninsula soil survey, scale 1:100 000. | N | K |
| SI4M | South Island 4 Mile | New Zealand Soil Bureau, 1968: General survey of the soils of the South Island, New Zealand, scale 1:253 440. | S | 0 |
| SHBW | Wairarapa soils from DJ Cowie | Personal Communication with J.D. Cowie, Southern Hawkes Bay Wairarapa. Listing of soils in Soil Conservation Centre Internal Report 64. | N | A |
| SPL | Special 4-mile soil, pt 48b | Special 4‑mile soil, pt48b. | N | L |
| SPO | Unnamed soil from 4-mile survey | Unnamed soil from 4‑mile soil survey. | N | O |
| STI | Stewart Island | Leamy, M.L., 1974: Soils of Stewart Island (Rakiura), New Zealand, scale 1:126 720. | S | z |
| STRT | Stratford | Aitken, J.F. *et al.* 1978: Soils of Stratford County, scale 1:63 360. | N | v |
| TAUP | Soils of Taupo Region | Rijkse, W.C. (unpublished): Soil map of Taupo County. Land Inventory County Series, scale 1:63 360. | N | t |
| TIC | Taieri County | Leamy, M.L., Leslie, D.M., 1973: Land Inventory Survey, County Series: Taieri soils, scale 1:63 360. | S | l |
| TINI | Tiniroto‑Wairoa Area | Rijkse, W.C. 1979‑80: Soils of Wairoa County, scale 1:63 360. | N | s |
| TIU | Taieri Uplands | Ragg, J.M., Miller, R.B., 1977: Soil survey of part Taieri Uplands, Otago, New Zealand, scale 1:63 360. | S | n |
| UCL | Upper Clutha Valley | Leamy, M.L., Saunders, W.M.H., 1967: Soils and land use in the Upper Clutha Valley, Otago, scale 1:31 680. | S | f |
| WAAR | Waipoua‑Aranga Area | Cox, J.E. *et al.* 1983: Northland Peninsula soil survey, scale 1:100 000. | N | K |
| WAIV | Wairarapa Valley | Heine, J.C. 1975: Interim Report on soils of Wairarapa Valley, scale 1:126 720. | N | o |
| WAIW | Waimate West | Campbell, I.B. *et al.* 1970: Waimate West Soils. Land Inventory County Series, scale 1:63 360. | N | i |
| WELR | Wellington Region Interim Rep. | Heine, J.C. 1975: Interim Report on soils of Wellington Region, scale 1:63 360. | N | n |
| WHAU | Whangaparoa‑Auckland Area | Cox, J.E. *et al.* 1983: Northland Peninsula soil survey, scale 1:100 000. | N | K |
| WHCO | Whakatane County | Rijkse, W.C. 1981 (unpublished): Soils of Whakatane County, scale 1:63 360. | N | G |
| WHGC | Whangarei County | Taylor, N.H. *et al.* 1948: Soil map of Whangarei County, scale 1:63 360. | N | C |
| WHKA | Whangaroa‑Kaikohe Area | Cox, J.E. *et al.* 1983: Northland Peninsula soil survey, scale 1:100 000. | N | K |
| WHRC | Whareama Catchment | Gibbs, H.S. 1965: Soil map of Whareama catchment, Wairarapa, scale 1:126 720. | N | f |
| WKC | Waikouaiti County | Campbell, I.B., 1977: Soils of Waikouaiti County, Otago, New Zealand, scale 1:63 360. | S | m |
| WKRI | Waikari District | Griffiths, E., 1978: Soils of Waikari District, North Canterbury, New Zealand, scale 1:31 680. | S | t |
| WMCO | Waimea County | Chittenden, E.T., Hodgson, L., Dodson, K.J., 1966: Soils and agriculture of Waimea County, New Zealand, scale 1:126 720. | S | a |
| WNGC | Wanganui County | Campbell, I.B. 1977: Soils of part Wanganui County, scale 1:31 680. | N | l |
| WTCO | Waitotara County | Wilde, R.H. 1976: Soils of part Waitotara County, scale 1:31 680. | N | m |
| WTPU | Waiotapu District | Vucetich, C.G. *et al.* 1978: Soils, agriculture and forestry of Waiotapu Region, scale 1:31 680. | N | M |

1 Cox, J.E. *et al.* 1983: Northland Peninsula soil survey, scale 1:100 000, is referenced in the LRIS spatial data layers under a group ‘surcode’ of NRTH. Some other Landcare Research information systems have segregated this large survey and reference each map sheet separately as; AHIP, BAYI, HELN, HKNU, KARA, MADA, MAKA,MAWA, NCPE, RURO, WAAR, WHAU, WHKA. For completeness, these references also appear in the table above.

# Appendix 3. New Zealand Soil Classification Subgroups

Nomenclature for nzsc is taken from Hewitt (1998).

|  |  |  |  |
| --- | --- | --- | --- |
| ***nzsc code*** | ***Description*** | ***nzsc code*** | ***Description*** |
| **Anthropic Soils** | | | |
| AFA | Artifact Fill Anthropic Soils | AFC | Compacted Fill Anthropic Soils |
| AFE | Earthy Fill Anthropic Soils | AFST | Stony-tailings Fill Anthropic Soils |
| AFW | Wet Fill Anthropic Soils | ARB | Buried Refuse Anthropic Soils |
| ART | Typic Refuse Anthropic Soils | AT | Rocky Truncated Anthropic Soils |
| ATT | Typic Truncated Anthropic Soils |  |  |
| **Brown Soils** | | | |
| BAM | Mottled Acid Brown Soils | BAMP | Mottled-placic Acid Brown Soils |
| BAO | Peaty Acid Brown Soils | BAP | Placic Acid Brown Soils |
| BAT | Typic Acid Brown Soils | BAX | Pan Acid Brown Soils |
| BFA | Acidic Firm Brown Soils | BFAL | Acidic-allophanic Firm Brown Soils |
| BFC | Cemented Firm Brown Soils | BFL | Allophanic Firm Brown Soils |
| BFM | Mottled Firm Brown Soils | BFMA | Mottled-acidic Firm Brown Soils |
| BFMC | Mottled-Cemented Firm Brown Soils | BFP | Pallic Firm Brown Soils |
| BFT | Typic Firm Brown Soils | BLA | Acidic Allophanic Brown Soils |
| BLAD | Acidic-pedal Allophanic Brown Soils | BLAM | Acidic-mafic Allophanic Brown Soils |
| BLD | Pedal Allophanic Brown Soils | BLM | Mottled Allophanic Brown Soils |
| BLT | Typic Allophanic Brown Soils | BLX | Fragic Allophanic Brown Soils |
| BMA | Acidic Mafic Brown Soils | BMG | Magnesic Mafic Brown Soils |
| BMM | Mottled Mafic Brown Soils | BMMG | Mottled-magnesic Mafic Brown Soils |
| BMT | Typic Mafic Brown Soils | BOA | Acidic Orthic Brown Soils |
| BOC | Calcareous Orthic Brown Soils | BOH | Humose Orthic Brown Soils |
| BOI | Immature Orthic Brown Soils | BOM | Mottled Orthic Brown Soils |
| BOMA | Mottled-acidic Orthic Brown Soils | BOP | Pallic Orthic Brown Soils |
| BOT | Typic Orthic Brown Soils | BSA | Acidic Sandy Brown Soils |
| BSM | Mottled Sandy Brown Soils | BSP | Pallic Sandy Brown Soils |
| BST | Typic Sandy Brown Soils | BXT | Typic Oxidic Brown Soils |
| **Gley Soils** | | | |
| GAG | Granular Acid Gley Soils | GAH | Humose Acid Gley Soils |
| GAO | Peaty Acid Gley Soils | GAPH | Placic-humose Acid Gley Soils |
| GAT | Typic Acid Gley Soils | GAY | Ultic Acid Gley Soils |
| GOA | Acidic Orthic Gley Soils | GOC | Calcareous Orthic Gley Soils |
| GOE | Melanic Orthic Gley Soils | GOI | Ironstone Orthic Gley Soils |
| GOJ | Argillic Orthic Gley Soils | GOO | Peaty Orthic Gley Soils |
| GOQ | Saline Orthic Gley Soils | GOT | Typic Orthic Gley Soils |
| GRA | Acidic Recent Gley Soils | GRC | Calcareous Recent Gley Soils |
| GRO | Peaty Recent Gley Soils | GRQ | Saline Recent Gley Soils |
| GRT | Typic Recent Gley Soils | GSC | Concretionary Sandy Gley Soils |
| GSO | Peaty Sandy Gley Soils | GST | Typic Sandy Gley Soils |
| GUF | Fluid Sulphuric Gley Soils | GUFQ | Fluid-saline Sulphuric Gley Soils |
| GUO | Peaty Sulphuric Gley Soils | GUSQ | Sandy-saline Sulphuric Gley Soils |
| GXN | Nodular Oxidic Gley Soils | GXT | Typic Oxidic Gley Soils |
| **Allophanic Soils** | | | |
| LGO | Peaty Gley Allophanic Soils | LGT | Typic Gley Allophanic Soils |
| LIM | Mottled Impeded Allophanic Soils | LIMI | Mottled-ironstone Impeded Allophanic Soils |
| LIT | Typic Impeded Allophanic Soils | LOA | Acidic Orthic Allophanic Soils |
| LOM | Mottled Orthic Allophanic Soils | LOT | Typic Orthic Allophanic Soils |
| LOV | Vitric Orthic Allophanic Soils | LOVA | Vitric-acidic Orthic Allophanic Soils |
| LPI | Ironstone Perch-gley Allophanic Soils | LPT | Typic Perch-gley Allophanic Soils |
| **Granular Soils** | | | |
| NEL | Allophanic Melanic Granular Soils | NEM | Mottled Melanic Granular Soils |
| NET | Typic Melanic Granular Soils | NOA | Acidic Orthic Granular Soils |
| NOL | Allophanic Orthic Granular Soils | NOM | Mottled Orthic Granular Soils |
| NOMA | Mottled-acidic Orthic Granular Soils | NOT | Typic Orthic Granular Soils |
| NPA | Acidic Perch-gley Granular Soils | NPT | Typic Perch-gley Granular Soils |
| NPX | Oxidic Perch-gley Granular Soils | NXA | Acidic Oxidic Granular Soils |
| NXL | Allophanic Oxidic Granular Soils | NXM | Mottled Oxidic Granular Soils |
| NXMA | Mottled-acidic Oxidic Granular Soils | NXT | Typic Oxidic Granular Soils |
| **Melanic Soils** | | | |
| EMG | Magnesic Mafic Melanic Soils | EMM | Mottled Mafic Melanic Soils |
| EMT | Typic Mafic Melanic Soils | EOC | Calcareous Orthic Melanic Soils |
| EODC | Pedal-calcareous Orthic Melanic Soils | EOJ | Argillic Orthic Melanic Soils |
| EOJC | Argillic-calcareous Orthic Melanic Soils | EOM | Mottled Orthic Melanic Soils |
| EOMC | Mottled-calcareous Orthic Melanic Soils | EOT | Typic Orthic Melanic Soils |
| EPJ | Argillic Perch-gley Melanic Soils | EPT | Typic Perch-gley Melanic Soils |
| EPV | Vertic Perch-gley Melanic Soils | ERO | Peaty Rendzic Melanic Soils |
| ERT | Typic Rendzic Melanic Soils | ERW | Weathered Rendzic Melanic Soils |
| EVC | Calcareous Vertic Melanic Soils | EVM | Mottled Vertic Melanic Soils |
| EVT | Typic Vertic Melanic Soils |  |  |
| **Organic Soils** | | | |
| OFA | Acid Fibric Organic Soils | OFM | Mellow Fibric Organic Soils |
| OFS | Sphagnic Fibric Organic Soils | OHA | Acid Humic Organic Soils |
| OHM | Mellow Humic Organic Soils | OLBG | Burried-gley Litter Organic Soils |
| OLBZ | Burried-podzol Litter Organic Soils | OLO | Orthic Litter Organic Soils |
| OMA | Acid Mesic Organic Soils | OMM | Mellow Mesic Organic Soils |
| **Oxidic Soils** | | | |
| XNT | Typic Nodular Oxidic Soils | XOB | Brown Orthic Oxidic Soils |
| XOM | Mottled Orthic Oxidic Soils | XOT | Typic Orthic Oxidic Soils |
| XPN | Nodular Perch-gley Oxidic Soils | XPT | Typic Perch-gley Oxidic Soils |
| **Pallic Soils** | | | |
| PIC | Calcareous Immature Pallic Soils | PID | Pedal Immature Pallic Soils |
| PIM | Mottled Immature Pallic Soils | PIMD | Mottled-pedal Immature Pallic Soils |
| PIT | Typic Immature Pallic Soils | PJA | Aged Argillic Pallic Soils |
| PJC | Calcareous Argillic Pallic Soils | PJM | Mottled Argillic Pallic Soils |
| PJN | Sodic Argillic Pallic Soils | PJT | Typic Argillic Pallic Soils |
| PLC | Calcareous Laminar Pallic Soils | PLM | Mottled Laminar Pallic Soils |
| PLT | Typic Laminar Pallic Soils | PPC | Cemented Perch-gley Pallic Soils |
| PPJ | Argillic Perch-gley Pallic Soils | PPJX | Argillic-fragic Perch-gley Pallic Soils |
| PPT | Typic Perch-gley Pallic Soils | PPU | Duric Perch-gley Pallic Soils |
| PPX | Fragic Perch-gley Pallic Soils | PUJ | Argillic Duric Pallic Soils |
| PUJN | Argillic-sodic Duric Pallic Soils | PUM | Mottled Duric Pallic Soils |
| PUT | Typic Duric Pallic Soils | PXC | Calcareous Fragic Pallic Soils |
| PXCN | Calcareous-sodic Fragic Pallic Soils | PXJ | Argillic Fragic Pallic Soils |
| PXJM | Argillic-mottled Fragic Pallic Soils | PXJN | Argillic-sodic Fragic Pallic Soils |
| PXM | Mottled Fragic Pallic Soils | PXMC | Mottled-calcareous Fragic Pallic Soils |
| PXT | Typic Fragic Pallic Soils |  |  |
| **Podzols** | | | |
| ZDH | Humose Densipan Podzols | ZDQ | Ortstein Densipan Podzols |
| ZDT | Typic Densipan Podzols | ZDU | Humus-pan Densipan Podzols |
| ZDYH | Ultic-humose Densipan Podzols | ZGH | Humose Groundwater-gley Podzols |
| ZGT | Typic Groundwater-gley Podzols | ZOH | Humose Orthic Podzols |
| ZOT | Typic Orthic Podzols | ZPF | Fluid Perch-gley Podzols |
| ZPH | Humose Perch-gley Podzols | ZPHP | Humose-placic Perch-gley Podzols |
| ZPHQ | Humose-ortstein Perch-gley Podzols | ZPOZ | Peaty-silt-mantled Perch-gley Podzols |
| ZPP | Placic Perch-gley Podzols | ZPQ | Ortstein Perch-gley Podzols |
| ZPT | Typic Perch-gley Podzols | ZPU | Humus-pan Perch-gley Podzols |
| ZPZ | Silt-mantled Perch-gley Podzols | ZXF | Firm Pan Podzols |
| ZXH | Humose Pan Podzols | ZXP | Placic Pan Podzols |
| ZXQ | Ortstein Pan Podzols | ZXU | Humus-pan Pan Podzols |
| ZXX | Fragic Pan Podzols |  |  |
| **Pumice Soils** | | | |
| MIM | Mottled Impeded Pumice Soils | MIMW | Mottled-welded Impeded Pumice Soils |
| MIT | Typic Impeded Pumice Soils | MIW | Welded Impeded Pumice Soils |
| MOBL | Buried-allophanic Orthic Pumice Soils | MOI | Immature Orthic Pumice Soils |
| MOL | Allophanic Orthic Pumice Soils | MOM | Mottled Orthic Pumice Soils |
| MOT | Typic Orthic Pumice Soils | MOZ | Podzolic Orthic Pumice Soils |
| MPT | Typic Perch-gley Pumice Soils | MPU | Duric Perch-gley Pumice Soils |
| **Raw Soils** | | | |
| WF | Fluvial Raw Soils | WGF | Fluid Gley Raw Soils |
| WGFQ | Fluid-saline Gley Raw Soils | WGFU | Fluid-sulphidic Gley Raw Soils |
| WGQ | Saline Gley Raw Soils | WGS | Sandy Gley Raw Soils |
| WGT | Typic Gley Raw Soils | WGU | Sulphidic Gley Raw Soils |
| WHA | Active Hydrothermal Raw Soils | WO | Orthic Raw Soils |
| WS | Sandy Raw Soils | WT | Tephric Raw Soils |
| WX | Rocky Raw Soils |  |  |
| **Recent Soils** | | | |
| RFA | Acidic Fluvial Recent Soils | RFAW | Acid-weathered Fluvial Recent Soils |
| RFMA | Mottled-acidic Fluvial Recent Soils | RFMQ | Mottled-saline Fluvial Recent Soils |
| RFMW | Mottled-weathered Fluvial Recent Soils | RFQ | Mottled Fluvial Recent Soils |
| RFQ | Saline Fluvial Recent Soils | RFT | Typic Fluvial Recent Soils |
| RFW | Weathered Fluvial Recent Soils | RHI | Inactive Hydrothermal Recent Soils |
| ROA | Acidic Orthic Recent Soils | ROAW | Acid-weathered Orthic Recent Soils |
| ROM | Mottled Orthic Recent Soils | ROMP | Mottled-pallic Orthic Recent Soils |
| ROT | Typic Orthic Recent Soils | ROW | Weathered Orthic Recent Soils |
| RSA | Acidic Sandy Recent Soils | RSM | Mottled Sandy Recent Soils |
| RST | Typic Sandy Recent Soils | RTBL | Buried-allophanic Tephric Recent Soils |
| RTBP | Buried-pumice Tephric Recent Soils | RTM | Mottled Tephric Recent Soils |
| RTT | Typic Tephric Recent Soils | RXA | Acidic Rocky Recent Soils |
| RXOA | Peaty-acidic Rocky Recent Soils | RXT | Typic Rocky Recent Soils |
| **Semiarid Soils** | | | |
| SAH | Thick Aged-argillic Semiarid Soils | SAK | Alkaline Aged-argillic Semiarid Soils |
| SAT | Typic Aged-argillic Semiarid Soils | SAW | Weathered Aged-argillic Semiarid Soils |
| SIK | Alkaline Immature Semiarid Soils | SIM | Mottled Immature Semiarid Soils |
| SIQ | Saline Immature Semiarid Soils | SIT | Typic Immature Semiarid Soils |
| SJK | Alkaline Argillic Semiarid Soils | SJL | Laminar Argillic Semiarid Soils |
| SJM | Mottled Argillic Semiarid Soils | SJQ | Saline Argillic Semiarid Soils |
| SJT | Typic Argillic Semiarid Soils | SZQ | Saline Solonetzic Semiarid Soils |
| SZT | Typic Solonetzic Semiarid Soils |  |  |
| **Ultic Soils** | | | |
| UDM | Mottled Densipan Ultic Soils | UDP | Perch-gleyed Densipan Ultic Soils |
| UEM | Mottled Albic Ultic Soils | UEP | Perch-gleyed Albic Ultic Soils |
| UEY | Yellow Albic Ultic Soils | UPS | Sandy Perch-gley Ultic Soils |
| UPT | Typic Perch-gley Ultic Soils | USE | Albic Sandy Ultic Soils |
| USM | Mottled Sandy Ultic Soils | UST | Typic Sandy Ultic Soils |
| UYG | Magnesic Yellow Ultic Soils | UYM | Mottled Yellow Ultic Soils |
| UYMZ | Mottled-podzolic Yellow Ultic Soils | UYT | Typic Yellow Ultic Soils |
| UYZ | Podzolic Yellow Ultic Soils |  |  |

# Appendix 4. New Zealand Genetic Soil Groups

Nomenclature for nzgsoigrp is taken from Taylor and Pohlen (1970).

|  |  |  |  |
| --- | --- | --- | --- |
| ***nzgsoigrp*** | ***Description*** | ***nzgsoigrp*** | ***Description*** |
| BG | Brown-grey earth | IBGYG | Intergrade between brown-grey and yellow-grey earth |
| YG | Yellow-grey earth | UYG | Upland yellow-grey earth |
| IYGYB | Intergrade between yellow-grey and yellow-brown earth | IYGBGL | Intergrade between yellow-grey earth and brown granular loam |
| IYGRE | Intergrade between yellow-grey earth and recent soil | YBST | Yellow-brown shallow and stony soil |
| YB | Yellow-brown earth | IYBBL | Intergrade between yellow-brown earth and brown loam |
| IYBBGC | Intergrade between yellow-brown earth and brown granular clay | IYBRE | Intergrade between yellow-brown earth and recent soil |
| YB/BGL | Composite yellow-brown earth on brown granular loam | YB/BGC | Composite yellow-brown earth on broan granular clay |
| UYB | Upland yellow-brown earth | HCYB | High country yellow-brown earth |
| ISYBOR | Intergrade between subalpine yellow-brown earth and organic soil | IAYBOR | Intergrade between subantarctic yellow-brown earth and organic soil |
| PYB | Podzolised yellow-brown earth | UPYB | Upland podzolised yellow-brown earth |
| HCPYB | High country podzolised yellow-brown earth | ISPYBOR | Intergrade between subalpine podzolised yellow-brown earth and organic soil |
| IAPYBOR | Intergrade between subantarctic podzolised yellow-brown earth and organic soil | POD | Podzol |
| GPOD | Gley podzol | REND | Rendzina |
| IRENYG | Intergrade between rendzina and yellow-grey earth | IRENYB | Intergrade between rendzina and yellow-brown earth |
| IRENRE | Intergrade between rendzina and recent soil | YBS | Yellow-brown sand |
| PYBS | Podzolised yellow-brown sand | IYBSPOD | Intergrade between yellow-brown sand and podzol |
| YBP | Yellow-brown pumice soil | YBP/YG | Composite yellow-brown pumice soil on yellow-grey earth |
| YBP/YBS | Composite yellow-brown pumice soil on yellow-brown sand | YBP/YBL | Composite yellow-brown pumice soil on yellow-brown loam |
| PYBP | Podzolised yellow-brown pumice soil | PYBP/YBL | Podzolised composite yellow-brown pumice soil on yellow-brown loam |
| PYBL | Podzolised yellow-brown loam | YBL | Yellow-brown loam |
| IYBLYB | Intergrade between yellow-brown loam and yellow-brown earth | IYBLBGL | Intergrade between yellow-brown loam and brown granular loam |
| IYBLRE | Intergrade between yellow-brown loam and recent soil | YBL/YB | Composite yellow-brown loam on yellow-brown earth |
| YBL/YBS | Composite yellow-brown loam on yellow-brown sand | YB/BGL | Composite yellow-brown earth on brown granular loam |
| RL | Red loam | BL | Brown loam |
| BGL | Brown granular loam | IBGLYG | Intergrade between brown granular loam and yellow-grey earth |
| IBGLBL | Intergrade between brown granular loam and brown loam | BGL/YB | Composite brown granular loam on yellow-brown earth |
| BGC | Brown granular clay | PBGC | Podzolised brown granular clay |
| IBGCREN | Intergrade between brown granular clay and rendzina | GY | Gley soil |
| IGYYB | Intergrade between gley soil and yellow-brown earth | SAGY | Subalpine gley soil |
| OR | Organic soil | SAOR | Subalpine organic soil |
| SOL | Solonetzic soil | SARE | Saline recent soil |
| RE | Recent soil | RE/YBS | Composite recent soil on yellow-brown sand |
| RE/YBP | Composite recent soil on yellow-brown pumice soil | R/YP/YBL | Composite recent soil on yellow-brown pumice soil on yellow-brown loam |
| RE/YBL | Composite recent soil on yellow-brown loam | REG | Regosol |
| LIT | Lithosol | HYT | Hydrothermally altered soil |
| ANT | Anthropic soil | SUB | Subalpine |
| ALP | Alpine soil | `\*' | \*\*CLASSIFICATION PENDING\*\* |
| `!' | \*\*ALTERNATE SOIL NAME\*\* |  |  |

# Appendix 5. Correlation between Vegetation inventory 2nd Edition (veg2) and 1st Edition (veg).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***Vegetation code (Ed2)*** | ***Vegetation class*** | ***Vegetation code (Ed1)*** | ***Vegetation code (Ed2)*** | ***Vegetation class*** | ***Vegetation code (Ed1)*** |
| **Crops** | | | | | |
| cC | Cereal crops | pt L1 | cM | Maize | pt L1 |
| cP | Pip & stone fruit | pt L2 | cG | Grapes & berryfruit | pt L2 |
| cK | Kiwifruit | pt L2 | cS | Subtropical fruit | pt L2 |
| cR | Root & green fodder crops | L3 | cV | Vegetables or nurseries | L4 |
| **Grass** | | | | | |
| gI | Improved pasture | P1 | gS | Semi-improved pasture | pt P2 |
| gU | Unimproved pasture | pt P2 | gT | Short tussock grassland | P3 |
| gW | Snow tussock grassland | P4 | gR | Red tussock grassland | P5 |
| gD | Sand dune vegetation | P6 |  |  |  |
| **Scrub** | | | | | |
| sM | Manuka, kanuka | M1 | sC | *Cassinia* | M2 |
| sD | *Dracophyllum* | pt M3 | sF | Fern | M4 |
| sS | Subalpine scrub | M5 pt M13 | sX | Mixed indigenous scrub | pt M6 |
| sT | Mixed indigenous scrub with tree ferns | pt M6 | sB | Broom | M7 |
| sG | Gorse | M8 | sK | Blackberry | M9 |
| sW | Sweet brier | M10 | sA | Matagouri | M11 |
| sV | Mangroves | M12 | sL | Lupins | pt H3 |
| sH | Heath | pt M3 | sO | Coastal scrub | pt H3  pt M13 |
| sE | Exotic scrub | pt M6 |  |  |  |
| **Forest** | | | | | |
| fN | Kanuka forest | pt N5 | fC | Coastal forest | N1 |
| fK | Kauri forest | N2 | fP | Podocarp forest | N7 |
| fB | Broadleaved forest | pt N5 | fO | Lowland podocarp-broadleaved forest | N3a |
| fI | Highland podocarp-broadleaved forest | N3b | fD | Podocarp-broadleaved-beech forest | pt N3a n4a  (refer rules below) |
| fW | Lowland beech forest | N4a | fG | Highland beech forest | N4b |
| fU | Beech forest (undifferentiated) | N4 | fR | Exotic broadleaved forest | pt N6 |
| fF | Exotic conifer forest | pt N6 |  |  |  |
| **Herbaceous** | | | | | |
| hW | Wetland vegetation | H1 | hR | Rushes & sedges | H2 |
| hA | Alpine & subalpine herbfield/fellfield | H4 | hS | Saline vegetation | H5 |
| hP | Pakihi vegetation | H6 | hM | Semi-arid herbfield | pt H7 |
| hH | *Hieracium* | pt H7 | uV | Unvegetated land | - |

The following rules have been followed in converting **veg2** records to **veg**

1. Because the areal extent of ‘scattered’ vegetation classes (suffixed by an asterisk ‘\*’) is unknown, asterisked vegetation classes are moved to the end of the item string in the same order as they were originally recorded, e.g., gI5 sG\* fB4 sX\* cR1 correlates to P 1 N 5 l 3 m 8 m 6.

2. The combinant vegetation class fD (Podocarp-broadleaved-beech forest) poses particular problems depending upon its configuration.

a) If the areal extent of fD is less than or equal to twice the areal extent of succeeding vegetations then the ‘n4a’ part of fD goes behind these vegetations, e.g., fD6 sX3 gS1 becomes N3a m6 n4a p2

b) fD4 correlates to n3a n4a

c) fD5 correlates to N3a n4a

d) When fD is one of two or more scattered vegetations rule 1 applies, i.e., the scattered vegetations are recorded together at the end of the string in the order that they occur, e.g., sX7 fD\* gS3 sF\* becomes M 6 p 2 n3a n4a m 4

1. During 1:50 000 scale remapping of the Gisborne–East Coast region between 1985 and 1998, the slope class ‘G’ was subdivided to recognise precipitous slopes separately from very steep slopes. Precipitous slopes (H) have not been separately identified elsewhere. [↑](#footnote-ref-1)