Horizons Regional Council: Regional Information

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Lesson 1 - Introduction

This document describes where regional information can be found and how to use it to support the development and certification of Freshwater Farm Plans (FWFP) in the Horizons region. The information will enable you to:

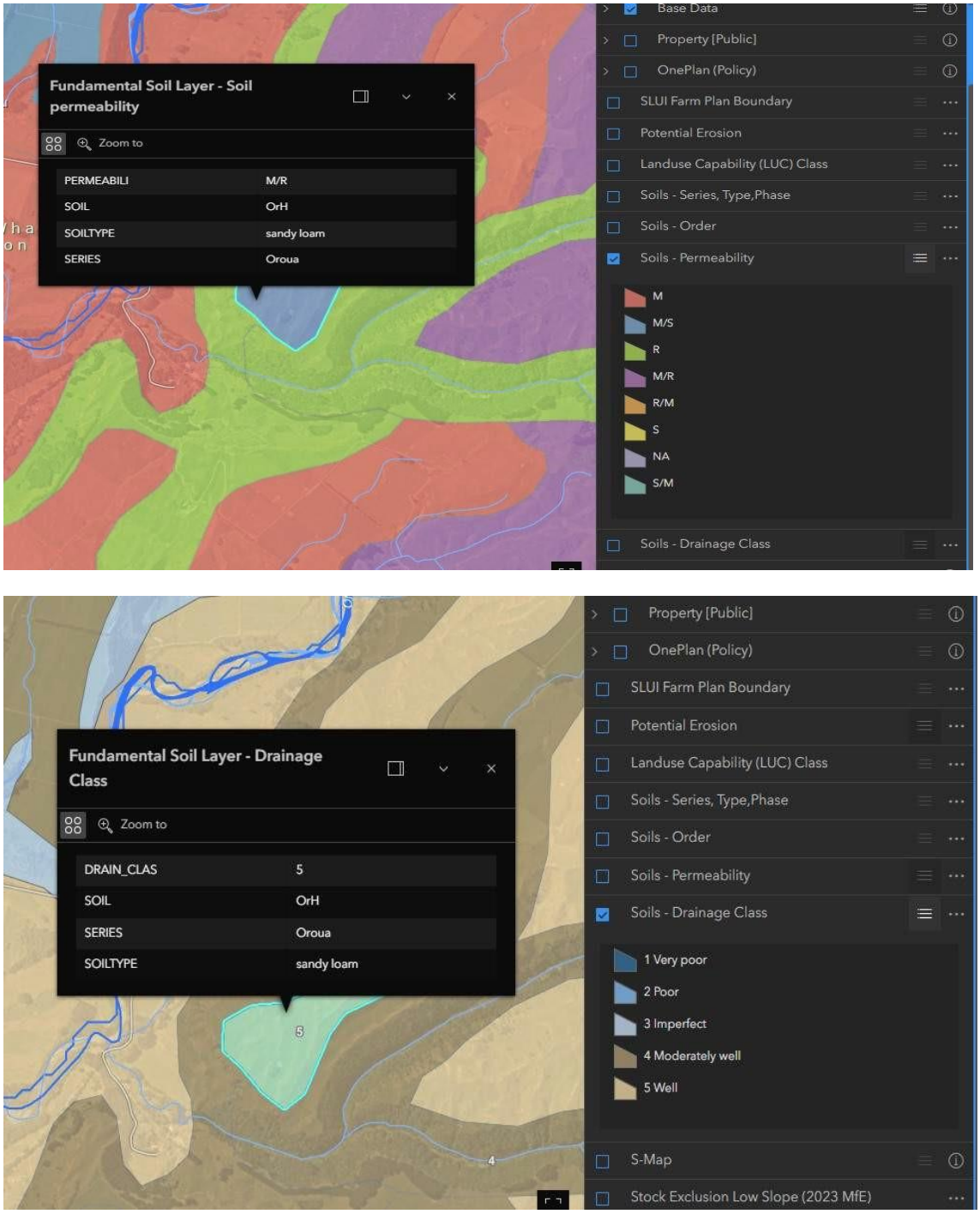
1) Find maps of the property information from links on Horizons Freshwater Farm Plans website
2) Interrogate mapping software to provide the desired attributes on a map
3) Understand the limits of scale and accuracy of different information sources
4) Access Sustainable Land Use Initiative (SLUI) maps and information and understand how to use them
5) Access existing farm Nutrient Management Plans (NMP) or Intensive Land Use (ILU) maps and information for farms in Target Catchments: Lake Horowhenua, Mangatainoka, Mangapapa, Tiraumea and Waikawa Catchments.

This document describes the layers and other information Horizons recommends for use for developing or certifying FWFPs. There is a wide variety of soil and land information available. This document focuses on information that will be most useful for mapping risk for a FWFP. It directs readers to the most relevant available information for prioritising the magnitude and location of sediment, pathogen, and nutrient loss on-farm.

Lesson 2 - Introduction to layers

Most of the information is in layer form, with the layers viewable on Horizons or external GIS as map views on viewer websites. Some are also in map output form or document form such as PDFs. Alternatively, for people with GIS capability, layers can be made available as shapefiles or raster files.

A layer can be viewed in a viewer. Layers can be turned on and off, and the zoom and pan tools can be used to move around to change the view. The information in shapefiles can be used to create several layers relevant to the situation so that several attributes can be assessed at once.



On the top image, the permeability layer is turned on and shows a view of a selected polygon with medium over rapid permeability. On the lower image, the drainage class layer is turned on showing that the drainage class of the same polygon is well drained. Both polygons provide different views of different information from the same shapefile.

Views can be exported to create map outputs such as PDFs or JPG files, for ease of printing or insertion into documents.

Lesson 3 - Recommended FWFP process

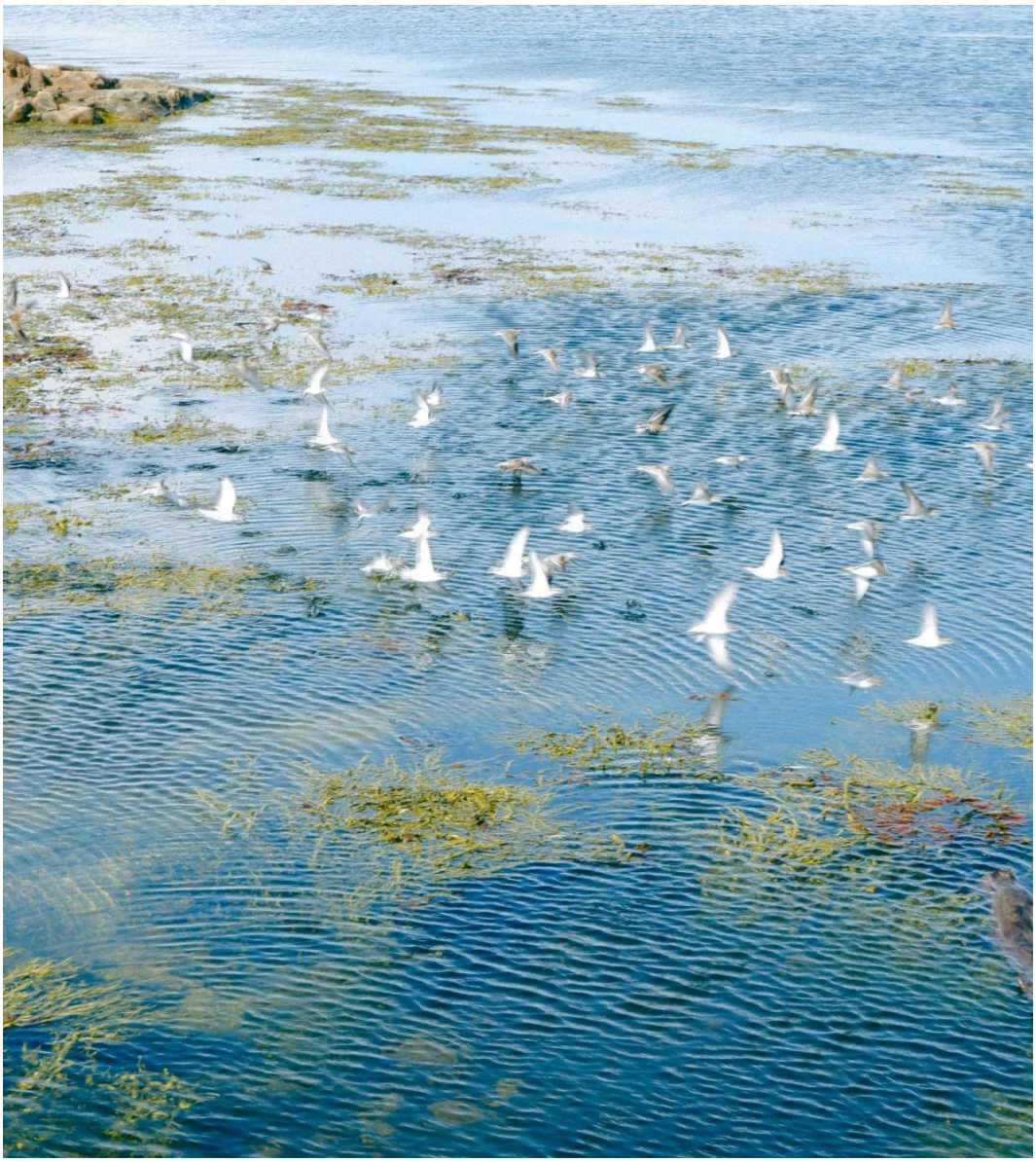
The recommended process for using the recommended layers to convert Catchment Context information to farm risk maps and then to actions is, in this order:

1) Interpret the Catchment Contexts and the contaminant threats to those values, to correctly prioritise some or all of the four major contaminants: pathogens, sediment, nitrogen, and phosphate. Refer to the Catchment Contexts document for how to check that the relevant contaminants have been prioritised to address the issues in the river.

2) Refer to the Landforms and Erosion documents to correctly identify the major pathways of travel (hill country erosion, overland flow or leaching) for the relevant contaminants to get to the waterways from the landforms on the farm.

3) Correctly map source/risk areas for the relevant contaminants at farm scale. Refer to the Landforms and Erosion documents.

4) Correctly list and map priority actions to address the issues that degrade the catchment values. Refer to the Landforms, Erosion and Nutrient Management documents for appropriate actions to address the risk.



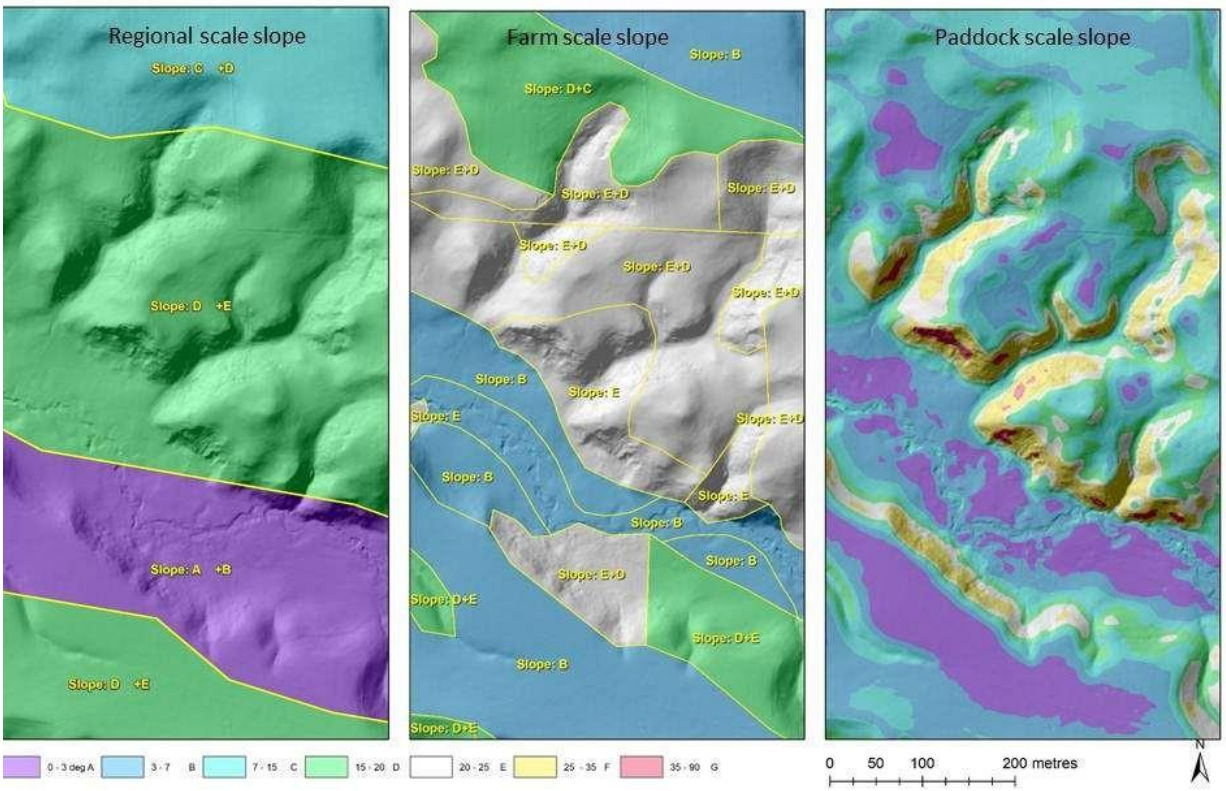
Implementing this process will provide a check that the:

- FWFP actions are focused on the important contaminants for the catchment
- Important pathways of travel of contaminants from the land to the water are understood, and mitigations are focused on the parts of the farm containing important sources of those contaminants
- Actions identified are of the appropriate type and intensity to make a meaningful impact on the priority contaminants leaving the farm.

Lesson 4 - Implications of scale

An appreciation of scale is vital when using any of the information:

- Regional scale means accurate enough to prioritise actions in a region or catchment
- Farm scale means accurate enough to be used to prioritise actions on a farm – e.g., location of afforestation blocks for erosion control on 7e steep hills
- Paddock scale means accurate enough to be used to prioritise actions within a paddock e.g., location of swale or channels for retaining grass strips to catch sediment from intensive winter grazing, or location of pole planting sites in gully lower- slope on 6e moderately steep land.



The left image shows regional scale slope from the NZLRI LUC. The middle image shows slope from the farm-scale SLUI LUC. The right-hand image shows 10m averaged slope from paddock scale LiDAR. It is obvious from comparing the three scales of slope information that neither regional scale slope nor farm scale slope are always accurate for estimating where trees might need to be planted in order to prevent sediment entering a stream, or grass buffer strips might need to be installed to catch sediment from intensive winter grazing.

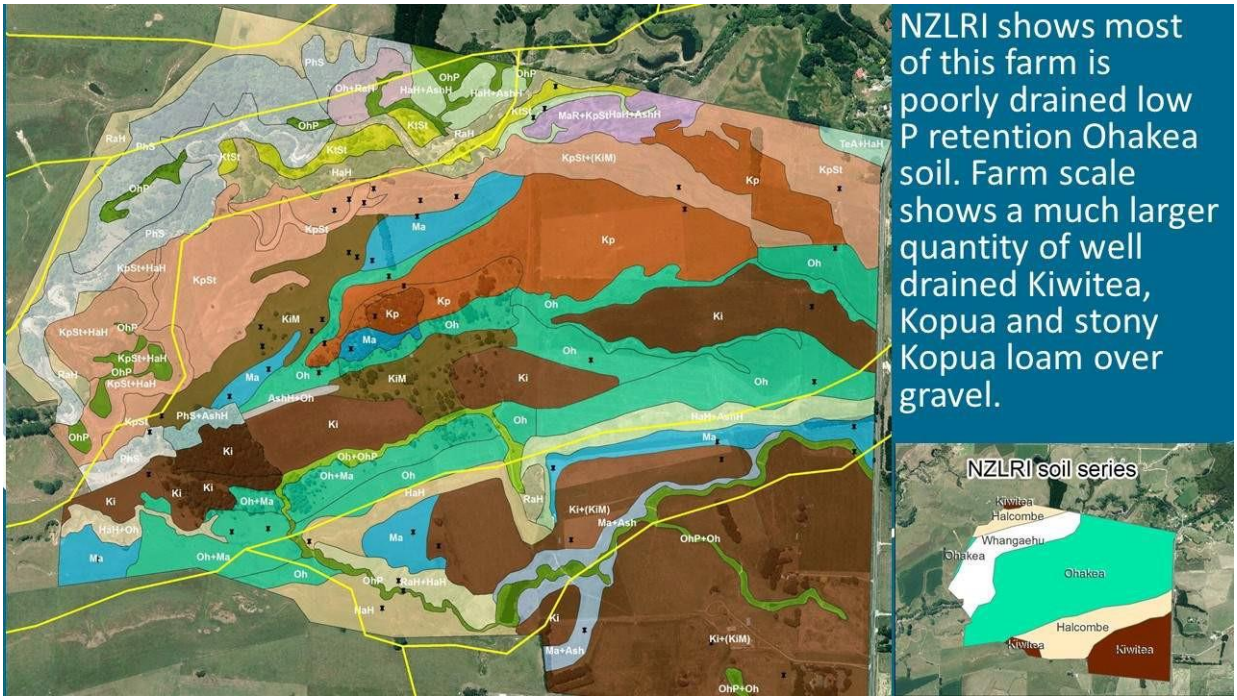
Most of the available information (aside from existing farm plans and slope maps) is at regional scale. The regional scale information is useful for connecting types of risk and level of risk to a soil type or LUC unit. However, regional scale information cannot be relied on for accurate identification of features and risk at farm scale.

Line work

Regional scale line-work (the boundaries of the mapped units) is usually not accurate enough to base farm recommendations on. Field checking is needed to adjust.

Attributes

Regional scale attributes (the content of the mapped units) are likely to be over-simplified. Often, regional scale information will show only the main soil or LUC information as being 'representative.' However, there are likely to be other soil types or LUC units present that may have different risk profiles. Often the high-risk or source areas that need to be identified and addressed at a farm scale may not be included in the 'representative' attribute.



This image shows regional scale soil information from the NZLRI Fundamental Soil Layer in the inset, and as yellow lines on the larger farm-scale map. It clearly illustrates how regional scale mapping is good for figuring out what soils might be on a farm and what their properties might be, but that the linework is not reliable.

Lesson 5 - Information available from Horizons

REGIONAL SCALE
Horizons Freshwater Farm Plans website (https://www.horizons.govt.nz/managing-natural-resources/our-freshwater-future/freshwater-farm-plans) External websites (see below)

FARM AND PADDOCK SCALE
Farm scale and paddock scale information are available from Horizons as PDFs or GIS files, on request for a specific farm or farms: • Paddock scale slope and hillshade layers • Paddock scale flow path information • SLUI farm plan maps and documents • Intensive Land Use (ILU) or nutrient management plan (NMP).

Horizons website map layers and documents

Horizons Freshwater Farm Plans website also includes links to information that is relevant for developing FWFPs.

Most of this information can be accessed directly through our Freshwater Farm Plan maps webpage. Some layers are available on request from Horizons. See below for more information:

Fundamental soil layers

- Soil series, type, and phase layer
- Soil order from the New Zealand Soil Classification Soil permeability layer
- Soil drainage class layer

NZLRI layers

- Erosion map for hill country
- Potential erosion severity and type, land use capability class, unit, rock type, soil, slope LUC legend map layer

Other

- Extent of SLUI farm plan coverage
- Extent of S-Map
- Extent of available LiDAR coverage (to create draft water flow lines for a farm)
- Aerial photography, including historic photography or websites
- MfE stock exclusion layer
- Taranaki-Manawatū Legend 1 page LUC unit key (Downloadable document) (https://www.horizons.govt.nz/HRC/media/Media/General/Taranaki-ManawatuLUClegend1diagram.jpg)
- Southern Hawkes Bay Wairarapa Legend 1 page LUC unit key (Downloadable document) (https://www.horizons.govt.nz/HRC/media/Media/General/Southern-Hawke-s-Bay-Wairarpa-LUC-legend-diagram.pdf).
- Wellington Legend 1 page LUC unit key (Downloadable document) (https://www.horizons.govt.nz/HRC/media/Media/General/Wellington-LUC-legend-diagram.pdf)

Relevant external website layers and documents

Several external websites provide useful regional scale information to assist with creating or checking risk maps for pathogens, sediment, N, and/or P on-farm. When accessing these websites it is important to get familiar with what data sources have been used to present the information, what the intended scale and use is, and what limits or constraints the data has. The external regional scale layers or sites include;

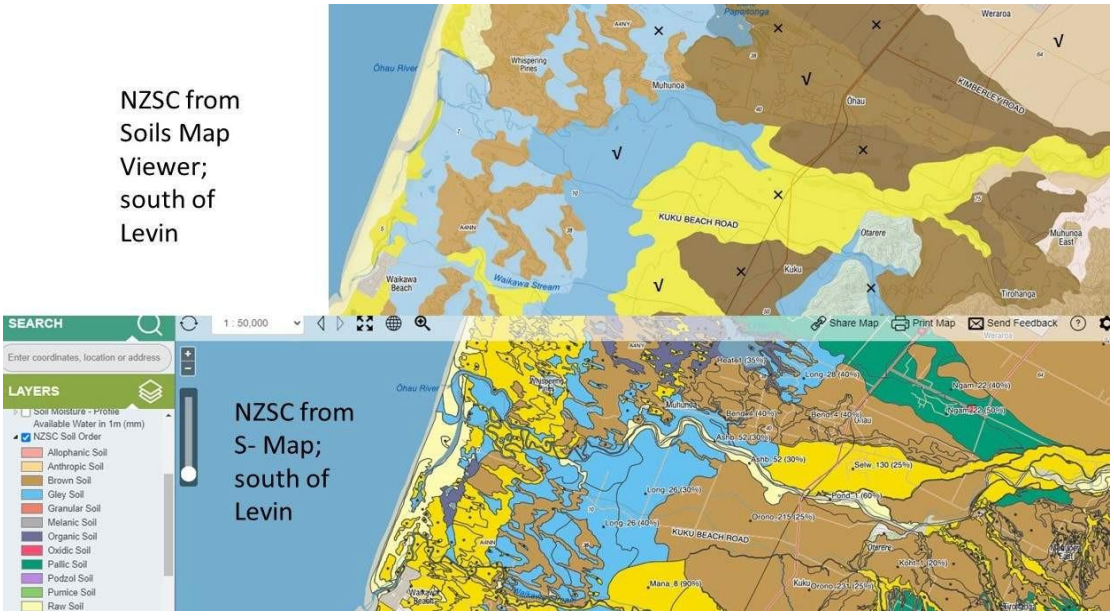
Regional-scale Land Use Capability maps

Regional-scale Land Use Capability maps (the NZLRI). This is viewable in Our environment (https://ourenvironment.scinfo.org.nz/) and contains information about land use capability, a basic slope map, and how to use it to assess risks.

S-map

S-map (https://smap.landcareresearch.co.nz/) is the latest and best regional scale soil information about soil types and key properties that affect risk.

Image: S-Map mapping just south of Levin, showing substantially less yellow alluvium, and in a different place than what was mapped in the Fundamental Soil Layer based on a provisional soil map from the 1970s. It also shows Pallic Soil, where Brown Soil was mapped before.



Landcare Research soils map viewer

The Landcare Research soils map viewer (https://soils-maps.landcareresearch.co.nz/) has information about soil types and key soil properties that affect risk. The Landforms document also has guidance on key soil properties that affect risk.

LUC and soils information

A wide variety of LUC and soils information can be downloaded from the LRIS portal (https://lris.scinfo.org.nz/) or the Koordinates (https://koordinates.com/) websites. Layers of particular usefulness are:

- 2021 land use capability layer – particularly for unit description and potential erosion types.
- Fundamental soil layer – search by property e.g., permeability, drainage class, NZSC.
- S-Map soil map unit boundaries.
- LRIS data dictionary.

Landscape DNA

In Landscape DNA (https://landscapedna.org/), the physiographic environments show regional scale assessments of risk of sediment, overland flow or leaching.

- They are most useful as an indicator of N leaching risk.
- The major physiographic environments of concern for leaching are the riverine and oxidising soil and aquifer environments.
- With the sibling classification turned on a more specific assessment of risk of N or P losses is obtained. This information is regional scale and based on modelling rather than field observations, so needs to be checked in the field. See the Landforms document for details.

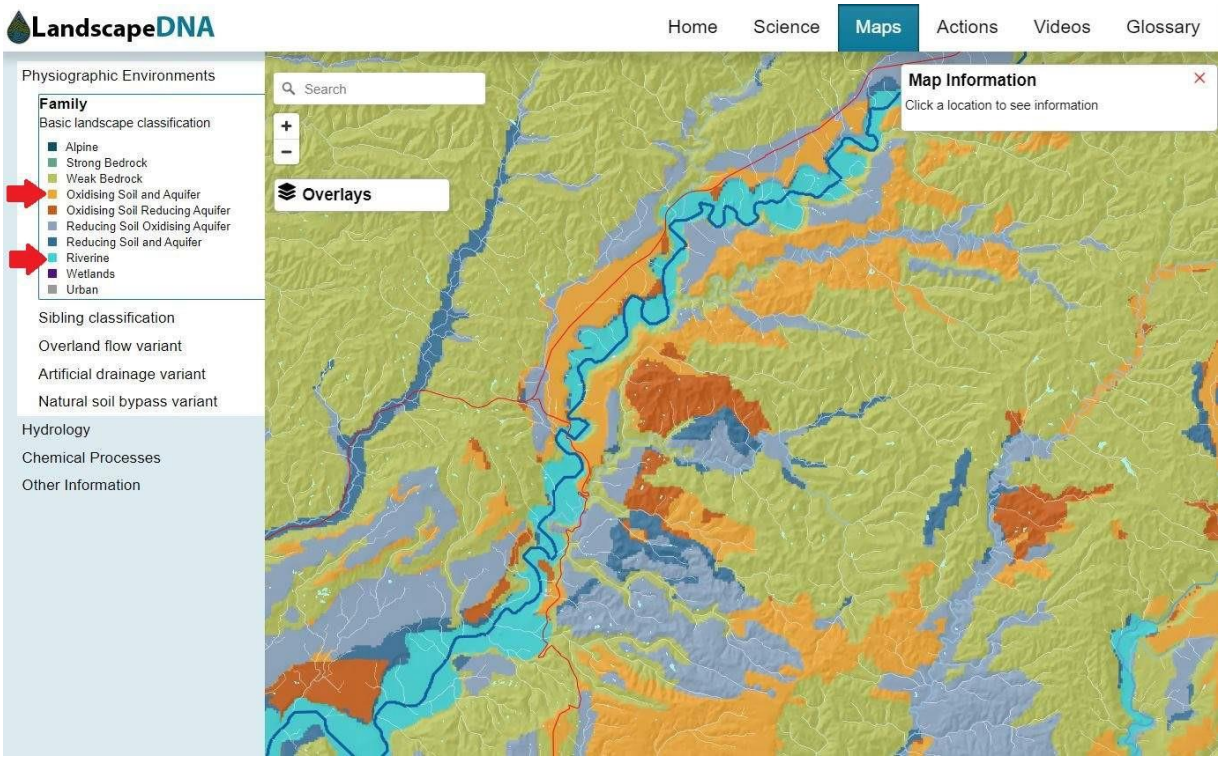


Image: Landscape DNA – basic landscape classification

Retrolens

Retrolens (https://retrolens.co.nz/Map/) website, by Land Information New Zealand, has downloadable historic imagery and is very useful for viewing historic context, for example, slip erosion to help estimate erosion potential.

Land Use Capability Classification of the Taranaki-Manawatu Region

Land Use Capability Classification of the Taranaki-Manawatū Region (downloadable document) (https://www.horizons.govt.nz/HRC/media/Media/General/Taranaki-Manawatu-LUC-legend-report.pdf)

Land Use Capability Classification of the Southern Hawkes Bay-Wairarapa Region

Land Use Capability Classification of the Southern Hawkes Bay-Wairarapa Region (downloadable document) (https://www.horizons.govt.nz/HRC/media/Media/General/Southern-Hawke-s-Bay-Wairarapa-LUC-Legend-report.pdf)

Land Use Capability Classification of the Wellington Region

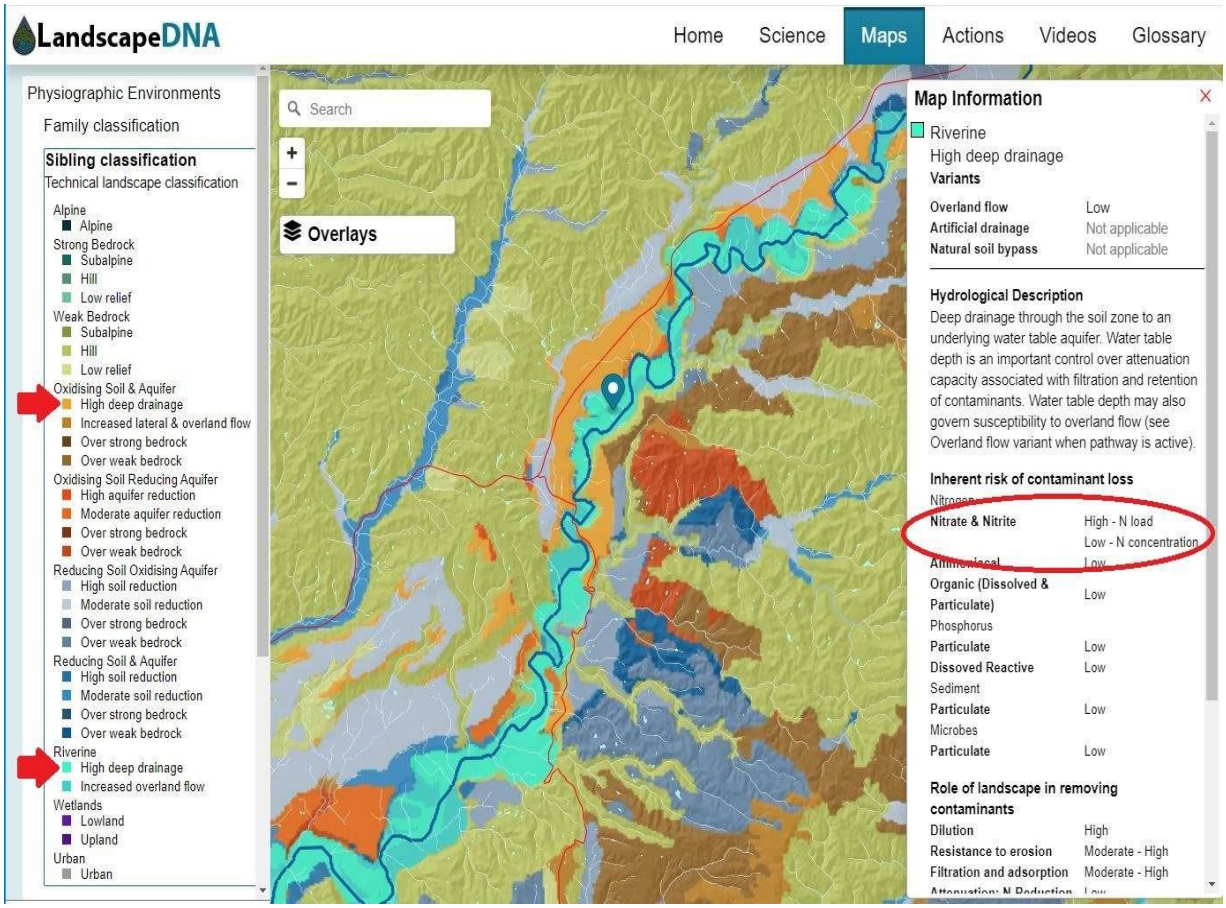
Land Use Capability Classification of the Wellington Region (downloadable document) (https://www.horizons.govt.nz/HRC/media/Media/General/Wellington-LUC-Legend-report.pdf)

Land Use Capability Survey Handbook

Land Use Capability Survey Handbook (https://www.tupu.nz/media/jzbjrpy4/land-use-capability-luc-survey-handbook-3rd-edition.pdf)

The LINZ data service

The LINZ data service website (https://data.linz.govt.nz/) has a number of very useful aerial photography and LiDAR elevation layers available. The NZ Elevation Survey Index layer can be used to see if LiDAR is downloadable for a farm and used to create a flow path map for a farm.



Landscape DNA – technical landscape classification. The Riverine and Oxidising Soil and Aquifer physiographic environments in the Landscape DNA website are the key danger landforms for nitrate leaching. The sibling layer from landscape DNA provides a more detailed risk assessment. If you click on one of the polygons you can see the risk of nitrate leaching as shown. It is important to note that this is regional scale information and needs field checking for the presence of the water table, as mentioned in the hydrological description shown.

Paddock scale slope and hillshade layers

Paddock scale slope and hillshade layers for a farm area can be obtained from Horizons by emailing freshwaterfarmplans@horizons.govt.nz and requesting the data from the Land Information team. These layers are the most important resource for mapping or checking slip or overland flow erosion risk. If there is LiDAR coverage of the farm area, Horizons can provide:

- A 1m cell hillshade map
- A 1m cell slope map categorised into LUC slope classes.
- A 10m averaged 1m cell slope map categorised into LUC slope classes

There may be a time-recovery cost associated with the provision of this information.

Lesson 6 - Information from SLUI plans (and other plans that Horizons holds)

There is a large amount of information in SLUI farm plans that is relevant for developing FWFPs. The focus of this document is on relevant spatial information (detailed below) that is directly applicable to the identification of risk, risk prioritisation and selection of effective actions in developing FWFPs. Information in the farm plan document; particularly erosion potentials and discussion about recommended works may also be useful.

SLUI farm plans have farm scale LUC mapping. This is more accurate than the NZLRI regional scale LUC for identifying erosion risk. SLUI LUC mapping can be used to identify areas of erosion resistant rock that might not be mapped in regional layers; for example, greywacke or limestone rock, which have lower slip erosion potential for a particular slope than the more common papa (mudstone and sandstone rocks). Refer to the Erosion document.

SLUI LUC mapping shows a sediment priority class, which provides a valuable guide to prioritise land for actions to control erosion. It is a guide only and needs to be checked against field evidence.

SLUI LUC also contains information on potential erosion, type of erosion, soils, strengths, weaknesses, and recommended land use for different units, to aid the prioritisation and choice of appropriate actions. This is available in shapefiles and in a table in the farm plan document.

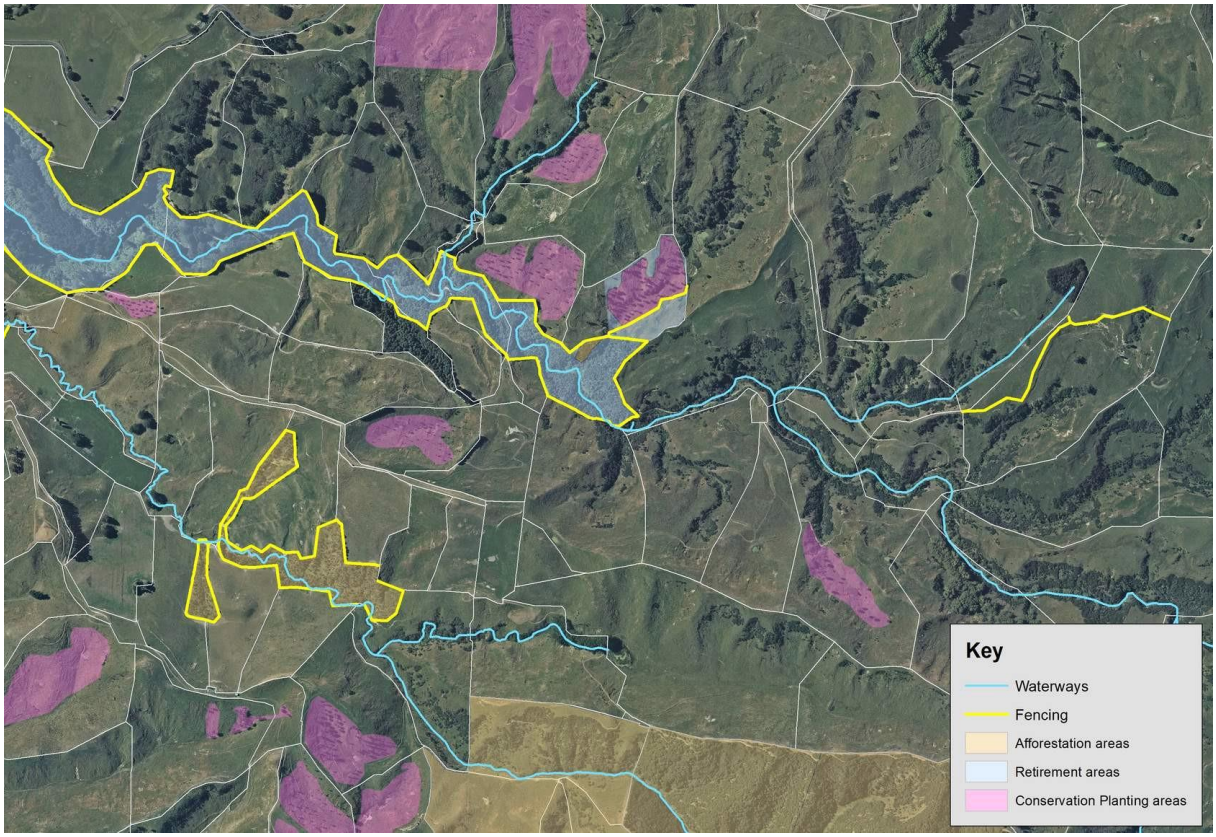
Hectares	LUC	LUC2	LUC_Class	HEL_Class	HEL_Text	Rock	Soil	Slope	Vege	RLU	Erosion	OVRL_Eros	Pot_OVRL	Water	Cover	Cov10TH
10.845895	VIe15	6e15	6	1	E	Sm	AsH	E+F	gSsX	C/F	1Ss	1	2	0.5	Sm	1
6.094335	VIc2	6c2	6	0	N	Lo	OoH	D+E	gS	I	0	0	0	0	U	0
10.420766	VIIe13	7e13	7	2	H	Sm	UuH	E+F	gSfO	C/F	1Ss	2	3	0.5	F	1
15.706071	IVe4	4e4	4	0	N	Mo+Al/Sm	Oh	C+D	gS	C	0	0	0	0	U	0
16.712733	IVe8	4e8	4	1	E	Sm	As+Mt	D	gS	C	1GSh	0.5	3	0.5	Sm	1

A piece of a SLUI LUC table showing how erosion risk varies on different LUC units, and how that relates to the rocktype and slope in hill country, or to the soil type on flats. These relationships can be used to draw accurate areas of risk of sediment loss in a freshwater farm plan.

As well as the SLUI LUC there are other files which contain useful information:

SLUI Work Polygons

SLUI Work Polygons contains areas which have received environmental works through the SLUI programme, in most cases this represents tree planting or areas retired from grazing.



A printout of progress on a SLUI farm plan, showing erosion control and biodiversity protection work that has been done over the life of the plan

SLUI Work Lines

SLUI Work Lines contains lines where fences have been funded through SLUI to retire areas, temporarily protect poles, but also the occasional water supply line.

SLUI Waterways

SLUI Waterways is a layer drawn by farmers on 1:10,000 aerial imagery at the time of mapping to show waterways on the farm. The limitation of this layer is that it has not been collected in line with the definition of a waterway in current regulations and should therefore be verified and updated where necessary.

SLUI Paddocks

SLUI Paddocks contains paddock boundaries and names for a SLUI farm plan.

Paddocks and boundary from a SLUI farm plan.

SLUI Boundary

SLUI Boundary contains the framed boundary. Note that this is adjusted from the legal parcels to include 'give and take' areas, it also contains some areas that farmers didn't initially regard of as part of their farm or that that they may not legally own – such as areas of bush or river reserve which may benefit from farm plan actions such as retirement.

The extent of SLUI farm plans is available on the Horizons Freshwater Farm Plans map viewer (https://experience.arcgis.com/experience/f9b78843515c463a816aad9330d1ffcf?views=View2InfoPanel1). Once you have the viewer open, tick the SLUI Farm Plan Boundary layer, and zoom in to make it visible. If there is an existing SLUI farm plan for the farm of interest, the document and shape files can be obtained from Horizons by emailing freshwaterfarmplans@horizons.govt.nz and tagging the Land Information team.

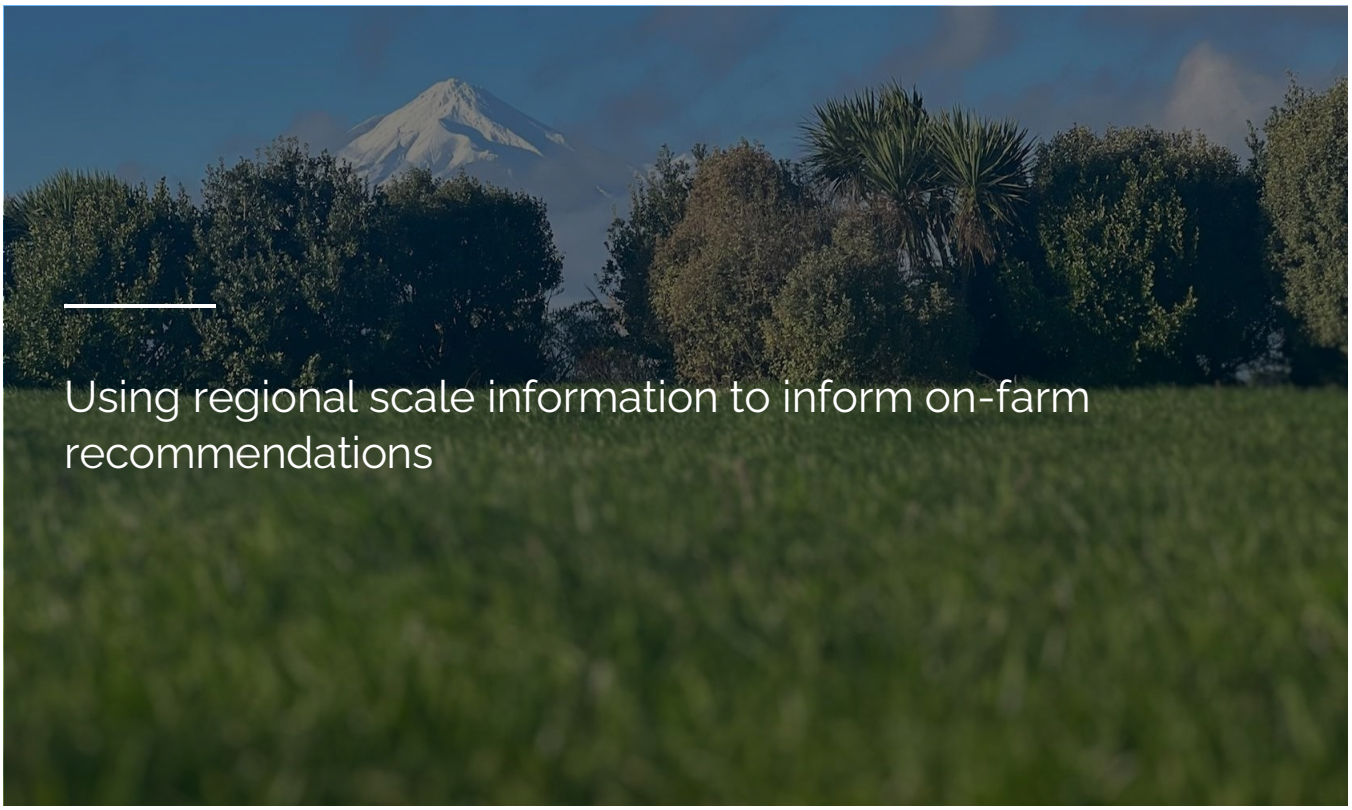
> **Note:** a farm plan developer or certifier will need to provide written permission from the landowner or farm operation for Horizons to release SLUI Farm Plan information.

As well as SLUI there are also Soil health plans and Environmental property plans which have some information.

Accessing Intensive Land Use (ILU) and Nutrient Management Plans (NMP)

For NMP maps and information for farms in Target Catchments: Lake Horowhenua, Mangatainoka, Mangapapa, Tiraumea and Waikawa Catchments and ILU Consent Nutrient Management Plans, email freshwaterfarmplans@horizons.govt.nz and tag the Rural Advice team.

Lesson 7 - Interpretation of regional and farm scale layers to map risk on-farm

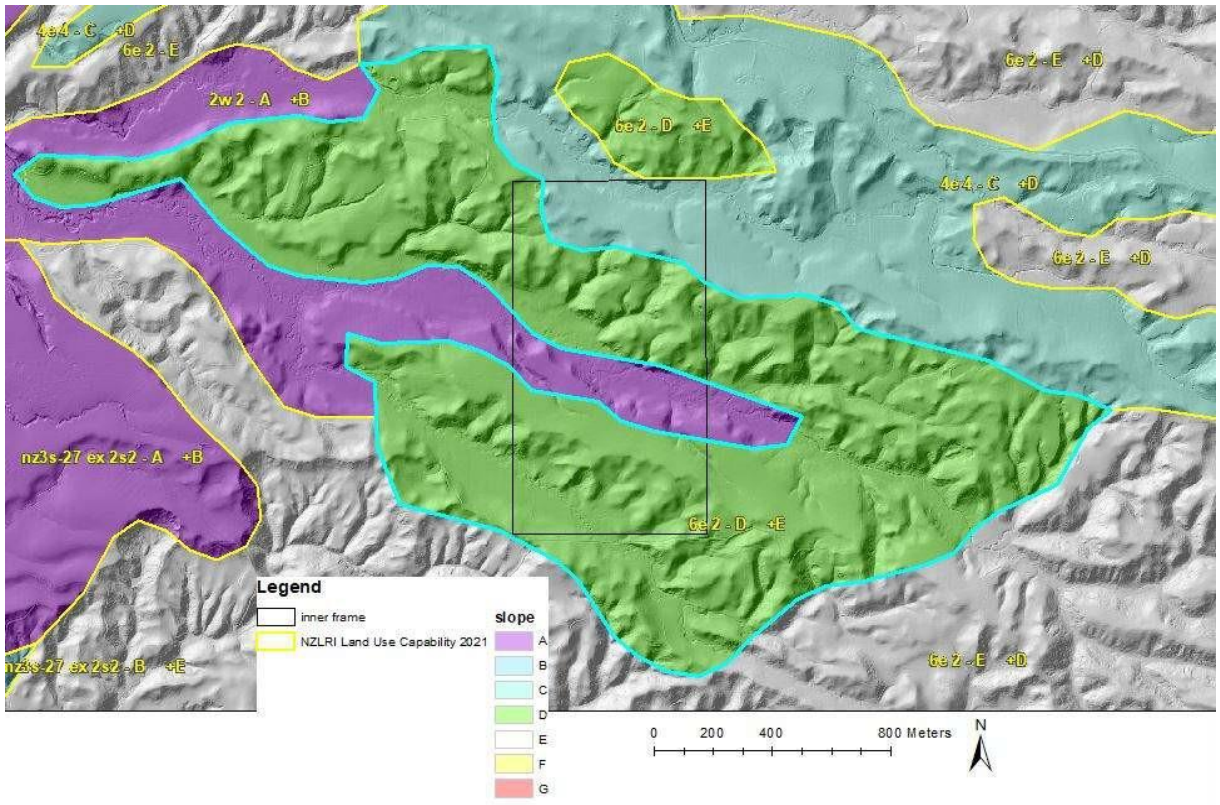


Most of the available information (aside from existing farm plans and slope maps) is at a regional scale. The regional scale information is useful for connecting types of risk and level of risk to a soil type or LUC unit. **However, regional scale information cannot be relied on for accurate identification of features and risk at farm scale.** The mapped soil may be wrongly identified, which could cause estimation of the wrong risk level, and implementation of actions in the wrong place or at the wrong level. To overcome this problem, the farm plan developer or certifier needs to undertake the following three steps.

STEP ONE

Step one

Identify key characteristics from the regional scale soil or Land Use Capability map units for the area around the farm, which can be confirmed on-farm. Key characteristics include slope, soil or rock type, erosion type and risk, other key landforms, or soil features that define the unit. It is useful to make these up as a mapping decision tree prior to visiting the farm.



The image above is a view of regional scale NZLRI units around a farm. There are four different LUC units shown:

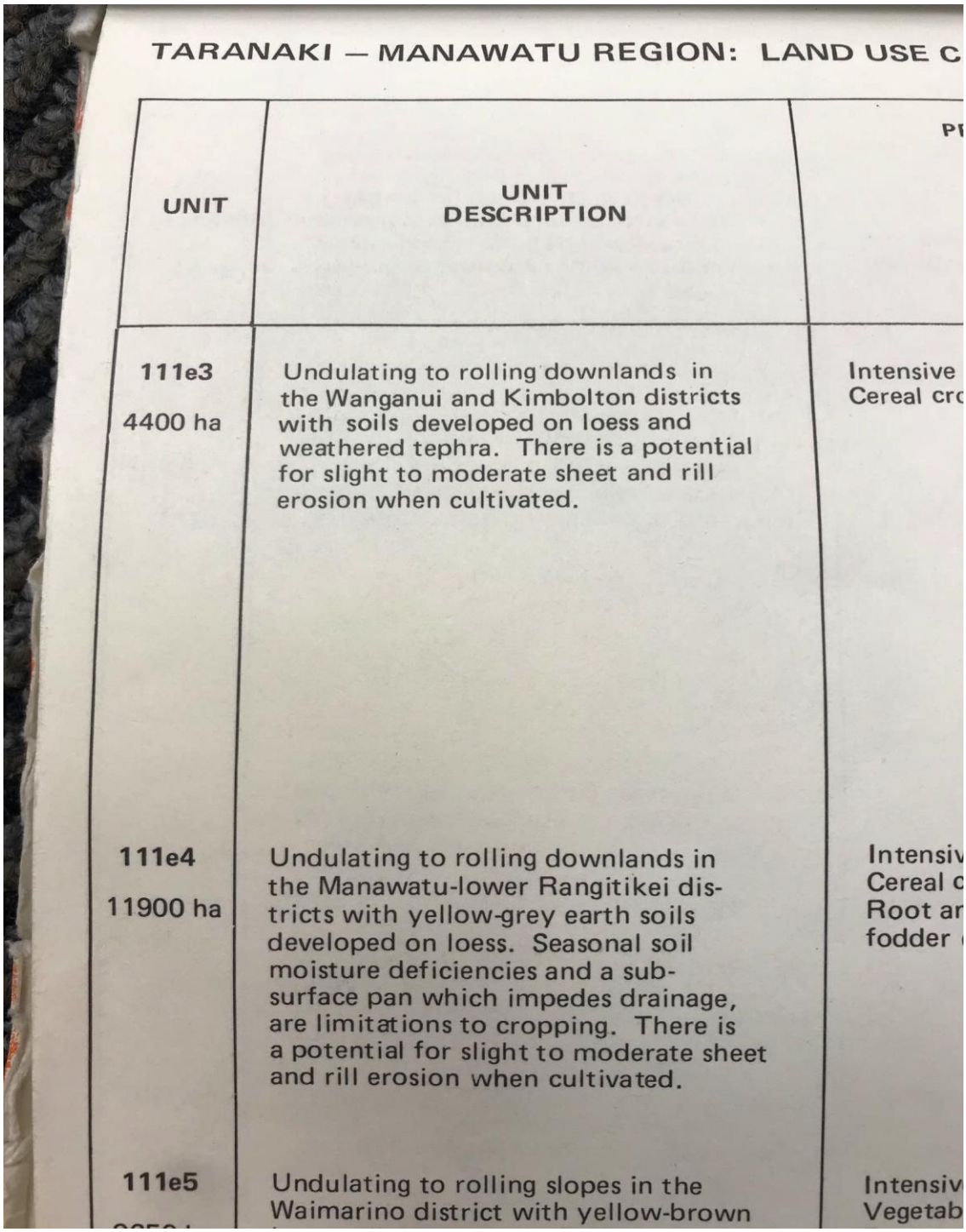
- 2w2 flats on the wet river silt low terrace (these have potential for very slight sheet erosion/overland flow under cultivation or intensive winter grazing and some streambank erosion)
- 2s2 flats on the wet loess higher terrace (these also have potential for slight sheet erosion under cultivation or intensive winter grazing)
- 4e4 strongly rolling loess (potential for moderate to severe sheet erosion under cultivation or intensive winter grazing)
- 6e2 on strongly rolling to moderately steep loess (potential for severe to very severe sheet erosion and slight soil slip.

Thus a clear erosion potential can be determined for different slope using the LUC units. However paddock scale slope should be used to map risk.

STEP TWO

Step two

Combine this with knowledge of risks for those soil or LUC units (e.g., a moderately steep mudstone LUC unit has potential for moderate slip erosion, a flat Marton soil LUC unit has potential for slight overland flow – see the Landforms and Erosion document for details on this).



TARANAKI — MANAWATU REGION: LAND USE C

UNIT	UNIT DESCRIPTION	PR
111e3 4400 ha	Undulating to rolling downlands in the Wanganui and Kimbolton districts with soils developed on loess and weathered tephra. There is a potential for slight to moderate sheet and rill erosion when cultivated.	Intensive Cereal cr
111e4 11900 ha	Undulating to rolling downlands in the Manawatu-lower Rangitikei districts with yellow-grey earth soils developed on loess. Seasonal soil moisture deficiencies and a sub-surface pan which impedes drainage, are limitations to cropping. There is a potential for slight to moderate sheet and rill erosion when cultivated.	Intensiv Cereal c Root ar fodder
111e5	Undulating to rolling slopes in the Waimarino district with yellow-brown	Intensiv Vegetab

This photo shows part of the Taranaki-Manawatu Extended Legend, featuring the description of LUC unit 3e4. 3e4 is defined by yellow grey earth soils developed on loess and (visible further over in the extended legend table) of gently rolling to undulating. At farm scale, that translates to mostly C slope (gently rolling).

STEP THREE

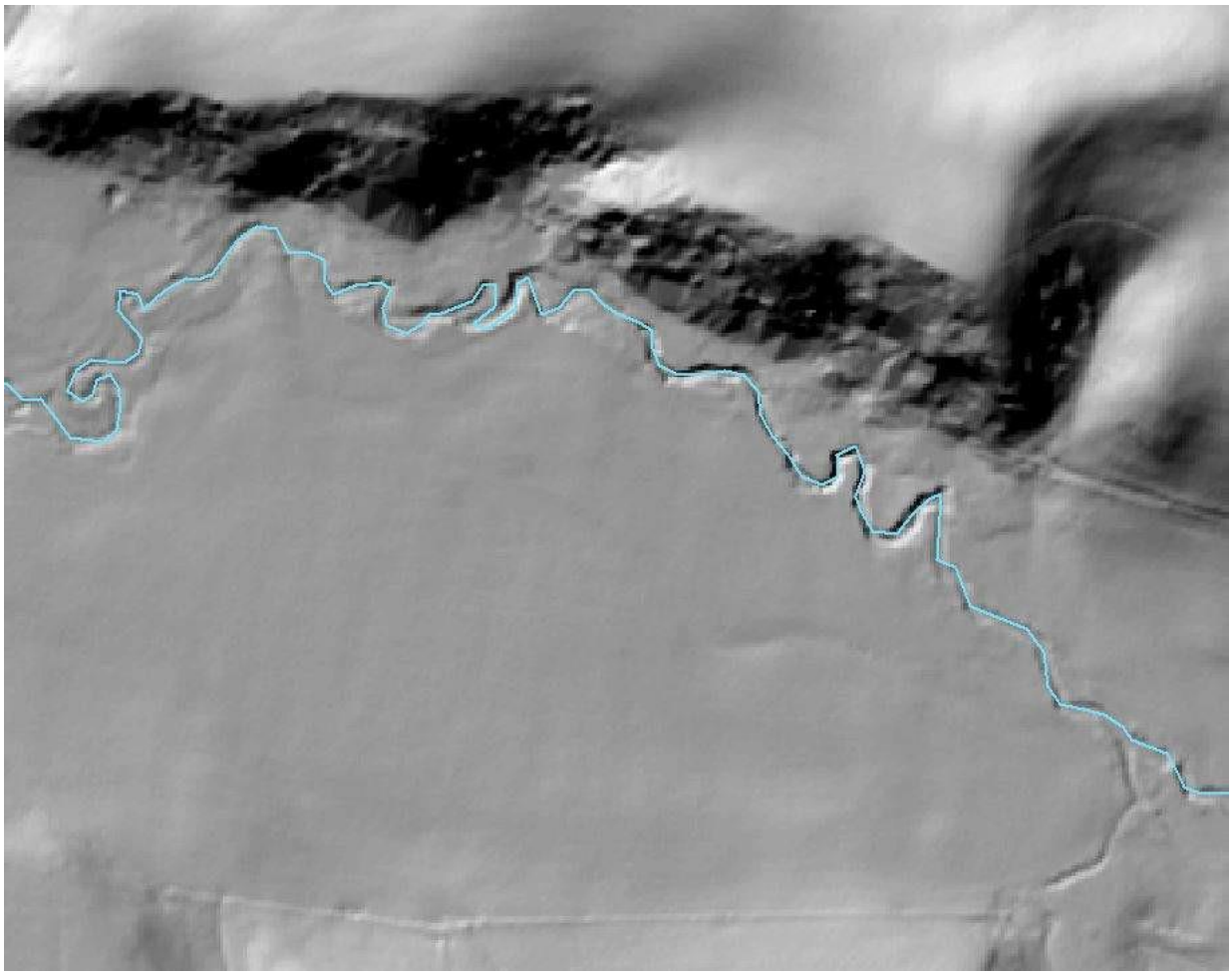
Step three

Use on-farm information such as aerial photography, historic imagery, hillshade maps, detailed slope maps, photos and field viewing to draw farm scale risk maps.

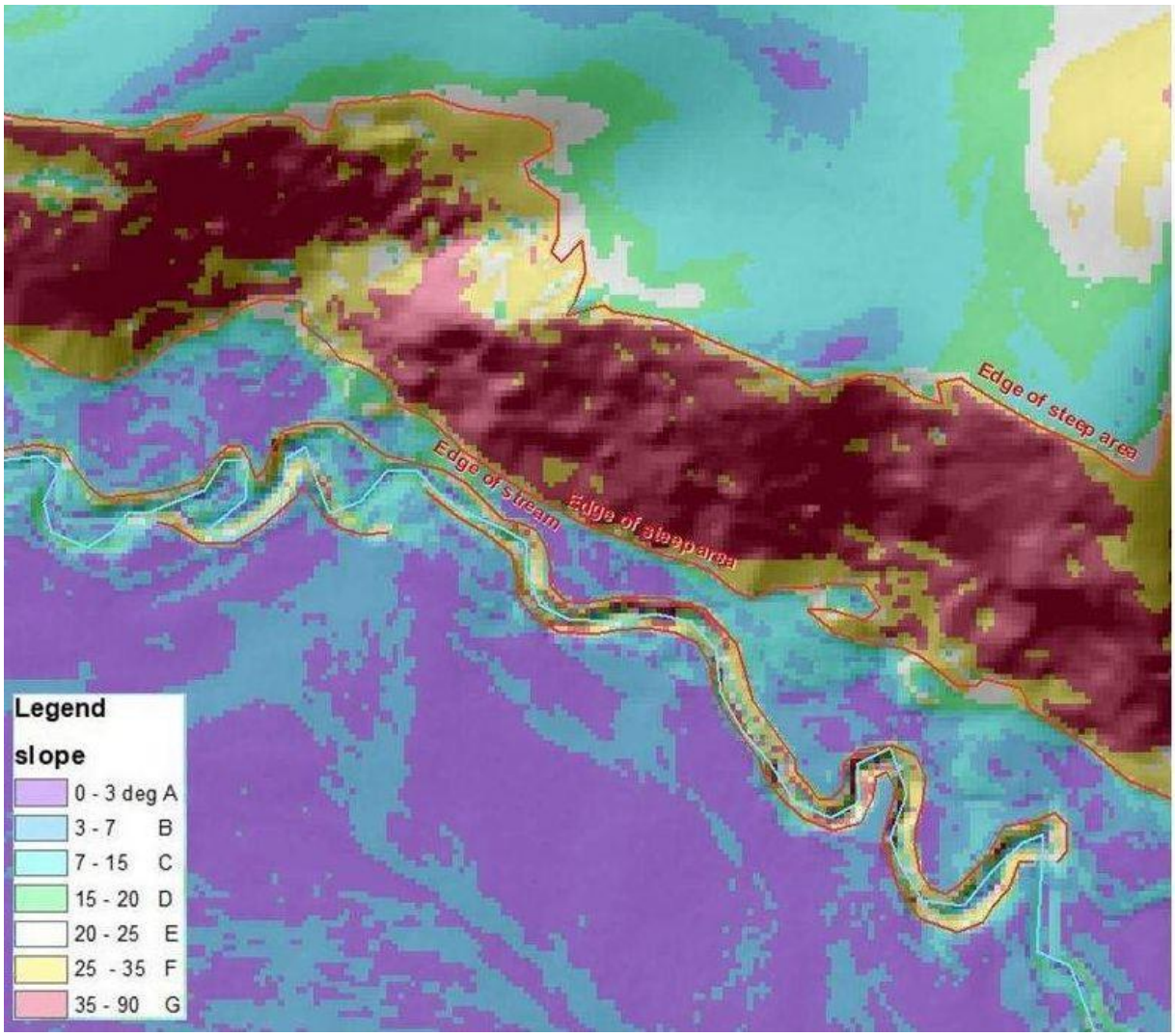
Using paddock-scale hillshade and slope layers

The hillshade map can be used to help visualise landforms such as streams, swales, rolling ground and hills which can be sediment, nutrient, or pathogen sources. Also this layer along with aerial photography and farm knowledge can help to quality control the slopes maps. There is no such thing as a 100% accurate slope map. Even LiDAR slope has errors; e.g., due to pylons, dense trees, maize crops, or imagery joins.

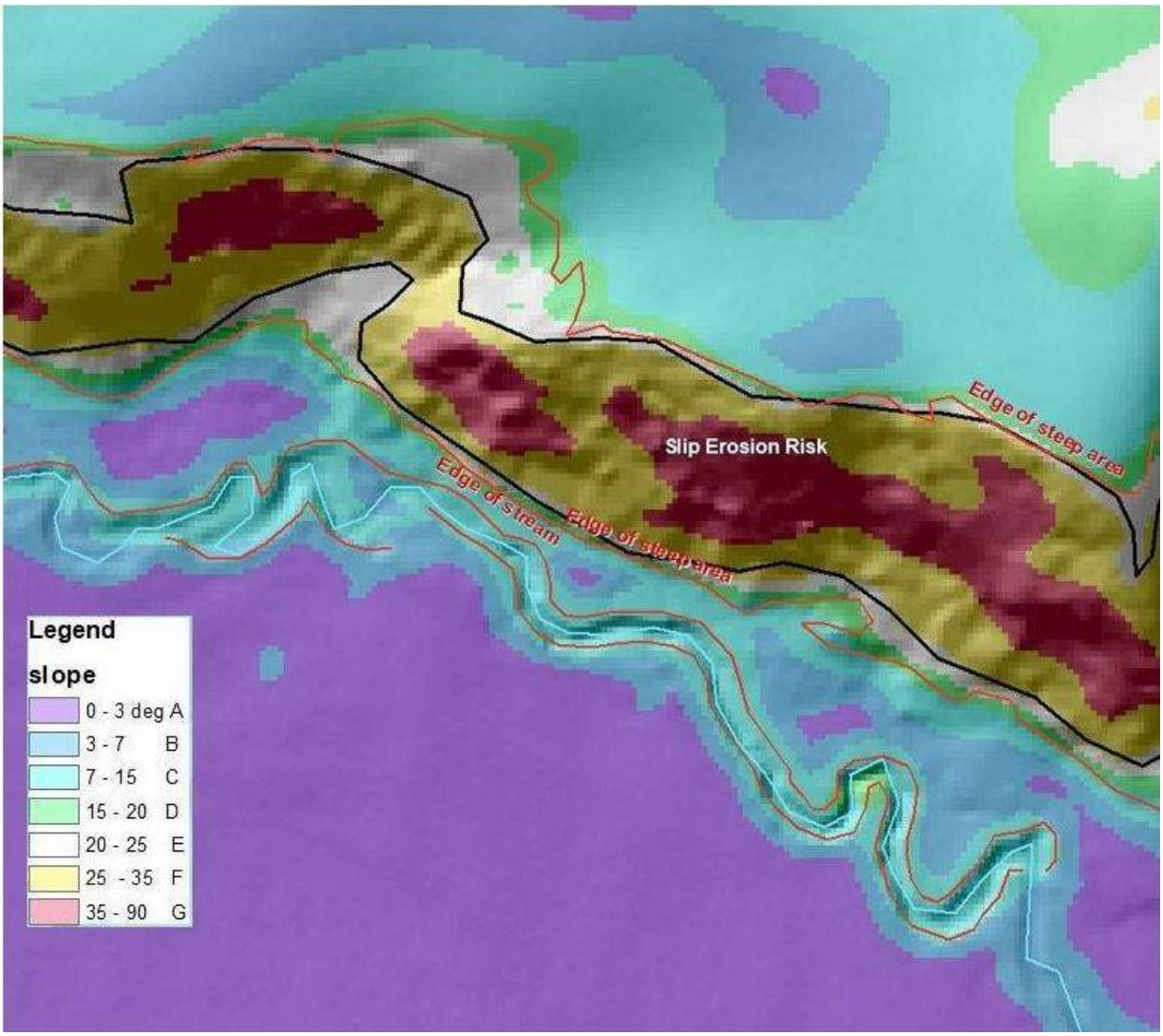
The hillshade maps and aerial photos should be used to identify those features, and therefore identify areas where the slope map may be in error. The 1m cell slope map can be used to accurately find edges of areas of risk, such as streams, the tops or bottoms of hills or steep areas. The 10m averaged slope map can be used to identify risk of overland flow or slip erosion, based, as outlined above or below.



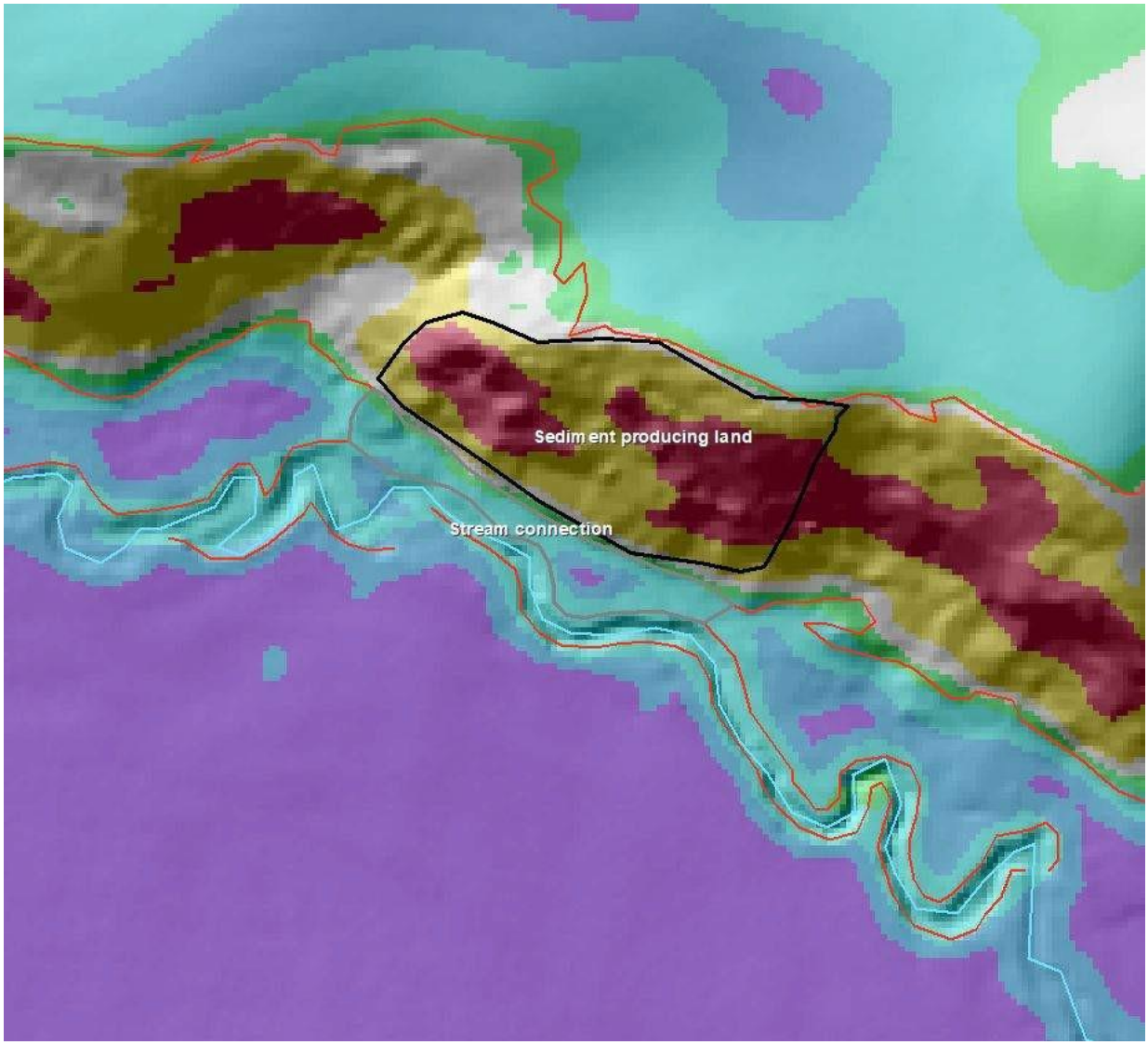
The hillshade map clearly shows the location of the stream and the hills in relation to the stream, so that risk of slip erosion entering the stream can be estimated.



The 1m LiDAR slope is the best product to use to draw lines of risk, because it most clearly outlines stream edges and edges of steep to very steep slip-prone land.

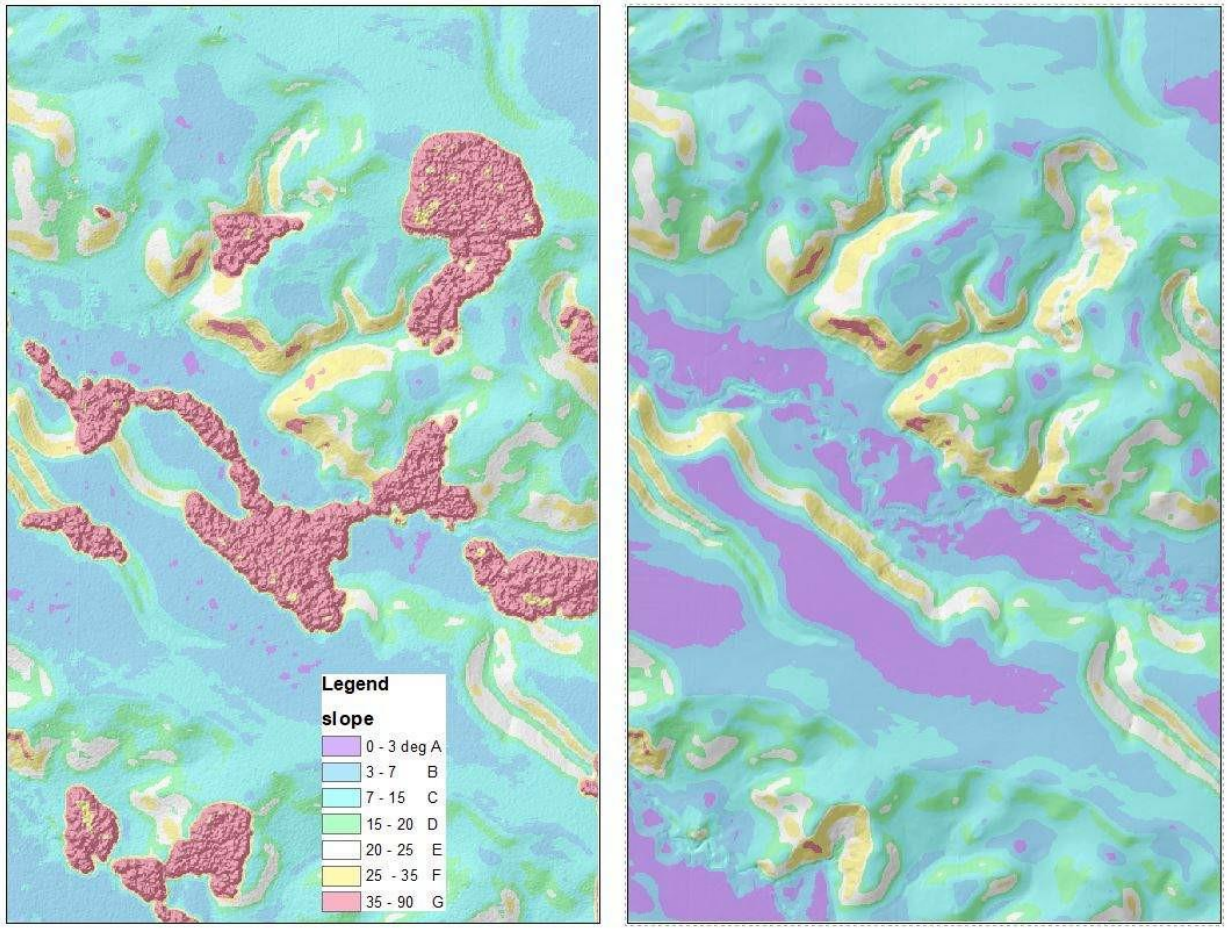


The 10m averaged LiDAR slope is the best product to use to estimate erosion risk from slope because it does not over-estimate the amount of steep and very steep land having severe erosion risk.



The image above shows how LiDAR slope and hillshade can be used to accurately draw an area of risk of slip sediment entering a waterway. Only parts of hills with both steep to very steep slope AND a runout to the stream were drawn. The same layers can be used to identify areas of rolling land that might generate sediment from intensive winter grazing and swales where that sediment could be caught.

If there is no LiDAR coverage of the farm area, the same products based on photogrammetry can be provided; a 1m hillshade, 1m slope and 10m averaged slope. These can mostly be used in the same way; however, extra precautions need to be taken. The photogrammetry slope measures the slope of the surface of the vegetation rather than the land surface. Where there is bare ground or pasture cover the 10m averaged slope works almost as well as LiDAR. But where there are edges of trees, shrubs, buildings, or other structures there is a lot of false very steep slope.



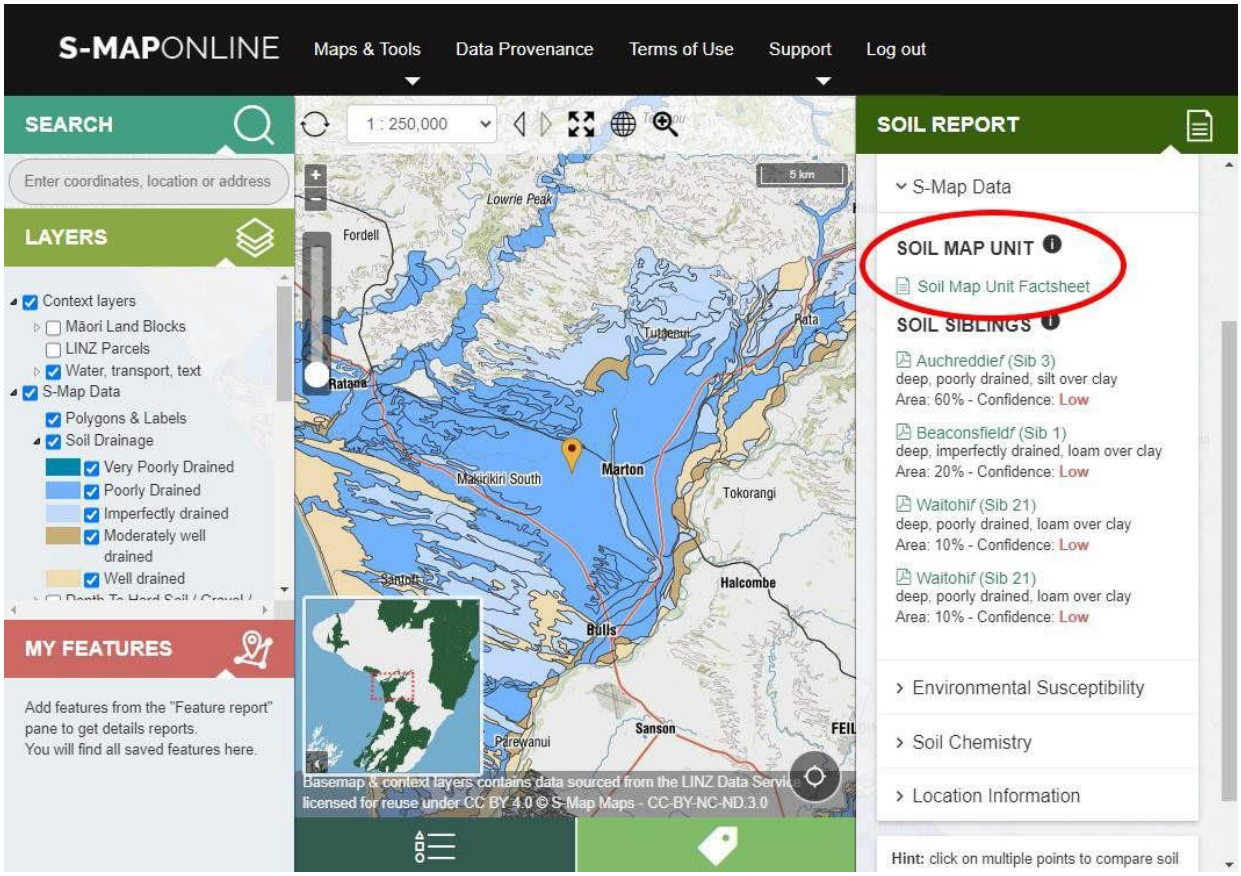
The left window shows photogrammetry slope and hillshade, while the right image shows slope and hillshade from LiDAR. There are obvious areas of false very steep slope where there were trees present at the time of the photography. Trees cannot be removed from photogrammetry, so this product is only useful for estimating slope where there are no trees. The false slope can be made clearly visible by displaying the photogrammetry hillshade with the slope. Erosion is mainly reduced to natural levels under trees, and no intensive winter grazing is done, so photogrammetry slope is still useful for drawing risk of erosion under pasture.

These areas of false slope need to be ignored as they are not real. The extent of the vegetation is readily apparent from the hillshade, (which clearly shows shading for trees, shrubs, long grass, maize etc) or aerial photos. Horizons can provide a map of where slope is expected to be false, but this indicator is not completely reliable where there are scattered trees. However, if the hillshade layer is viewed underneath the slope, the scattered trees become visible and the areas of false slope can be identified.

It is also possible to produce a water flowpath map from LiDAR data. Like the slope information, these are never 100% reliable and require field checking, but can provide a very good standardisation and quick visualisation from which to create a map of possible CSAs on-farm.

How to use S-map to find key regional scale soil properties for defining risk

- Go to the landforms document for guidance on key soil properties that may be of interest.
- Open S-map (https://smap.landcareresearch.co.nz/)
- Go to maps – see if S-map covers farm of interest – if not, go to the fundamental soil layer. If yes, then:
    - Zoom to the extent of the regional scale units that contain the property/farm
    - Click on the map.



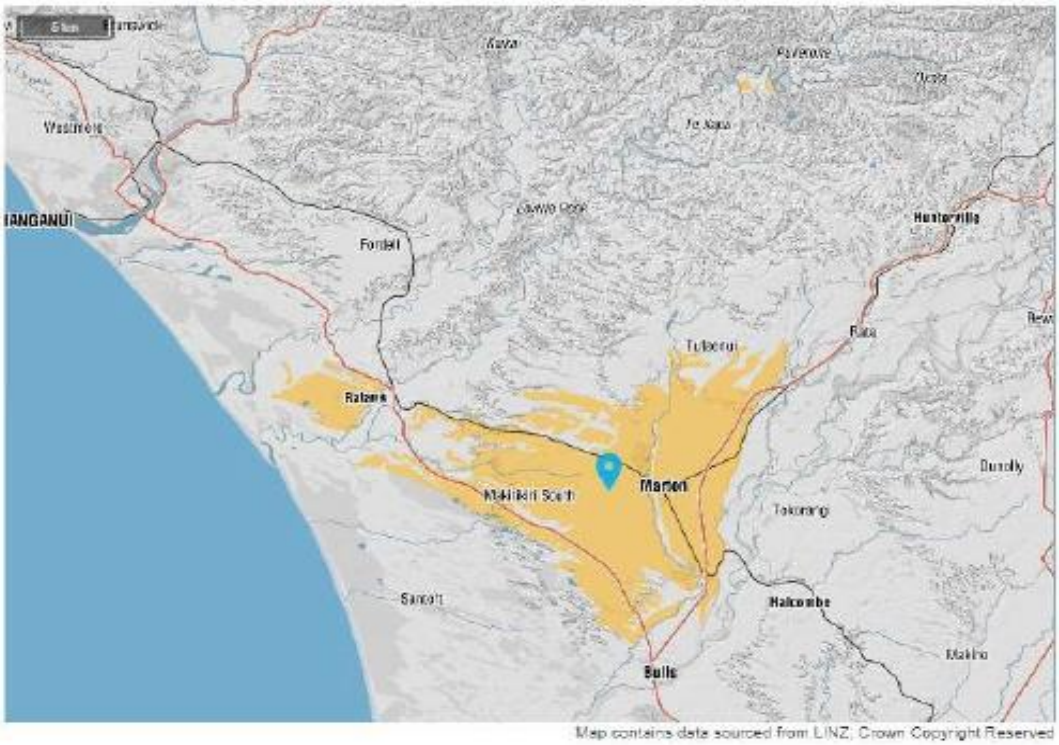
This shows how S-Map can be used to see the extent of a map unit, the members of the unit, and how to select the Soil Map Unit. You can select different layers on the left to display soil order, depth to gravel, or available moisture instead of drainage class.

- Click on the Soil Map Unit (SMU). It is important to open the map unit first before opening factsheets for individual soils because the map unit shows all of the members of the map unit and how to tell them apart.

- Note that the map colours only show colour according to the most common soil in the map unit. But often the less common soils are more important for environmental risk.

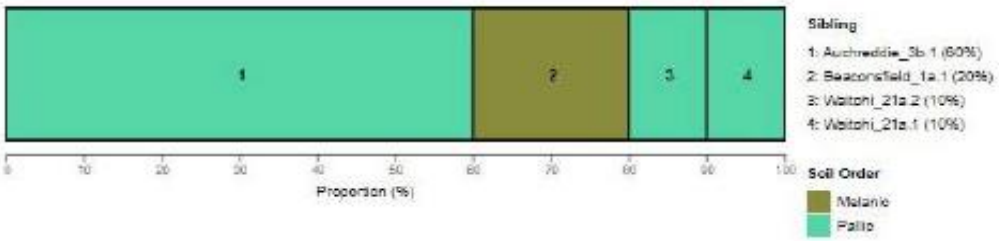
Soil map unit factsheet

Areas with Horizons\Rgtk_Ma map unit code are shown on the map below. A soil map unit is a collection of areas that have the same soils (i.e. siblings) in the same proportion.



Proportion of siblings in this map unit

Graph is coloured according to the NZSC soil order of each sibling within this map unit.



Soil properties of the siblings within the soil map unit

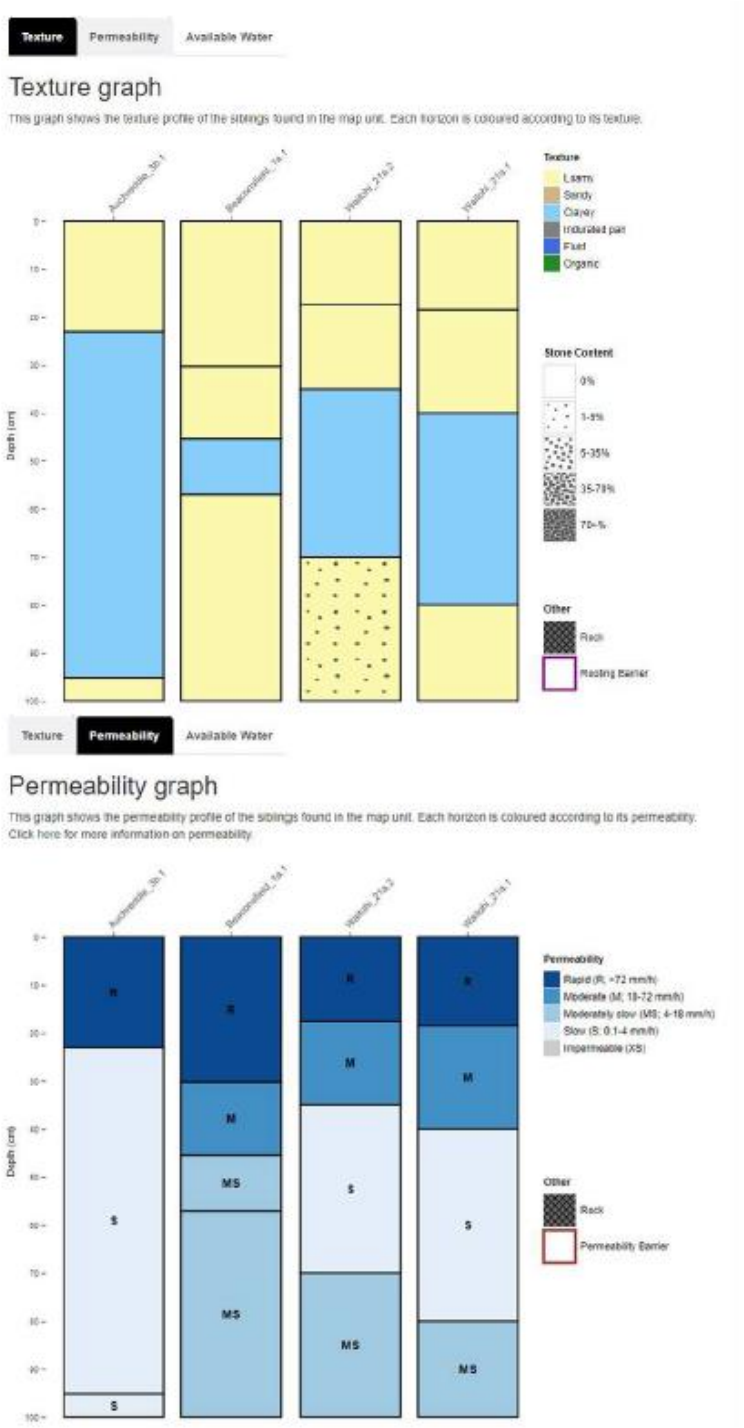
This table shows the details of the soil siblings within the map unit. The profile available water (Paw) is a measure of the capacity of the soil sibling to store water to a depth of 1 metre. Click the links below to find out more about each item:

Soil Order, Drainage Class, Depth Class

No.	Smap name	Proportion (%)	Depth	Texture	Drainage class	PAW (mm)	Order
1	Auchreddie_3b.1	60	Deep	silt over clay	Poorly drained	101.9	Pallic
2	Beaconsfield_1a.1	20	Deep	loam over clay	Imperfectly drained	120.6	Melanic
3	Waitohi_21a.2	10	Deep	loam over clay	Poorly drained	115.7	Pallic
4	Waitohi_21a.1	10	Deep	loam over clay	Poorly drained	113.4	Pallic

The Soil Map Unit Factsheet shows more clearly the extent of the map unit, and helps you start to visualise the differences between the members of the unit. Most of the unit is named poorly drained Auchreddie (normally known as Marton soil). Well drained Beaconsfield (normally known as Kiwitea) is also present while the other two relate to Halcombe rolling and Halcombe hill soil. You can scroll down to open tabs to show permeability or texture soil profile diagrams.

View the permeability and texture tabs to compare all the members of the soil map unit. These provide most of what is needed to know to predict overland flow on flat to undulating land, if overland flow or leaching is likely. See the Landforms document for more detail on relating risk to slope angle and permeability.



The texture tab and the permeability add further understanding to leaching risk. Stony texture has rapid permeability and has a high risk of N leaching through the soil, while clayey texture sometimes has a thick horizon with slow permeability. A thick horizon with slow permeability is associated with a high risk of overland flow.

- Vulnerability to leaching and runoff is also available, but bear in mind that:
    - N leaching information does not take denitrification into account – also refer to Landscape DNA
    - Overland flow information from S-map is only useful on land flatter than 7 degrees – elsewhere paddock scale slope should be used.

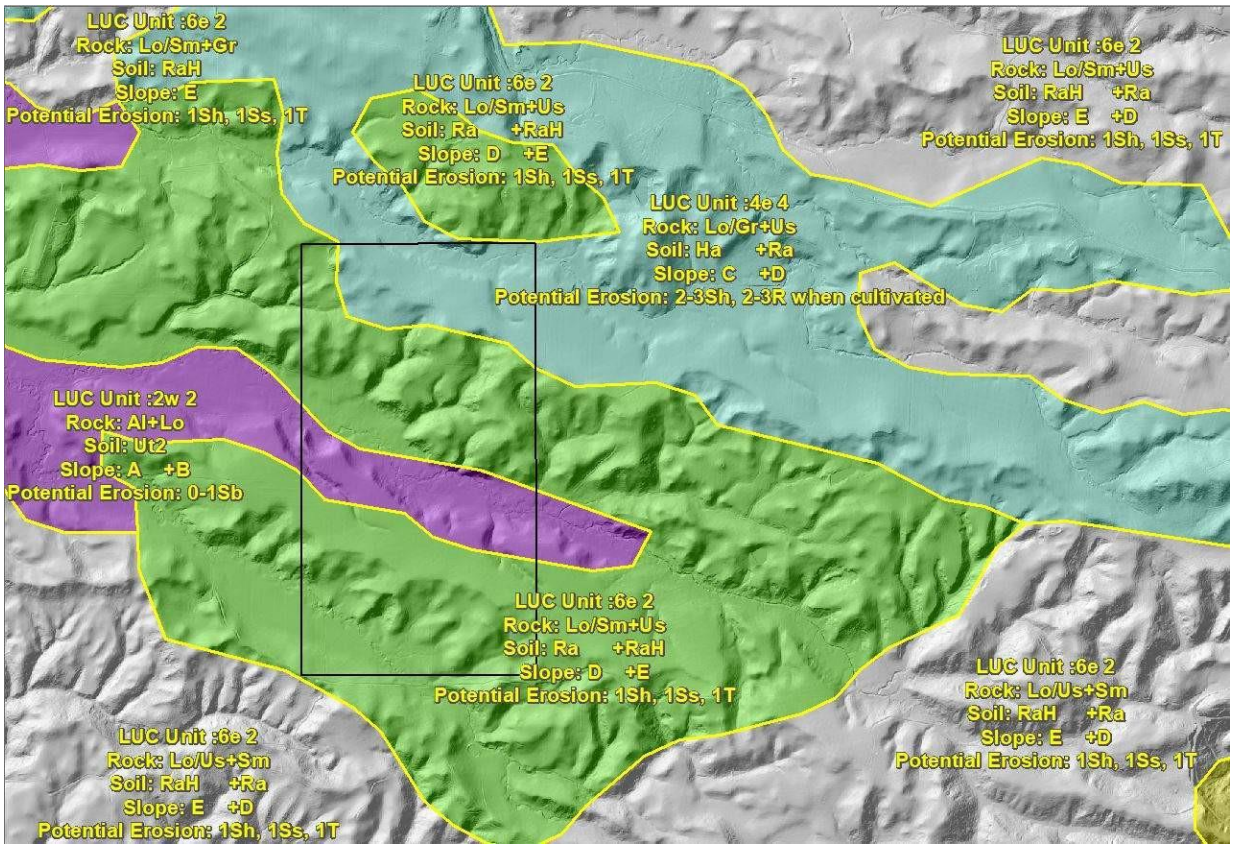
How to use the NZLRI LUC layers to find key regional scale soil properties for defining erosion risk

In hill country 6e land has potential for moderate erosion (moderate erosion risk) and class 7e land has potential for severe erosion. In the absence of SLUI farm-scale LUC, and for erosion forms other than slip erosion, the regional scale land use capability units can be used to associate potential erosion with an LUC unit. However, the line work is not accurate enough to be reliable for farm use.

How to use LUC rock-type suites to relate LUC suite unit to environmental risk on-farm

- Record the LUC units on and surrounding the farm
- Table the units according to erosion risk, slope and soil or rock type
- Check the farm rock, soil and slope information and redraw the boundaries and units

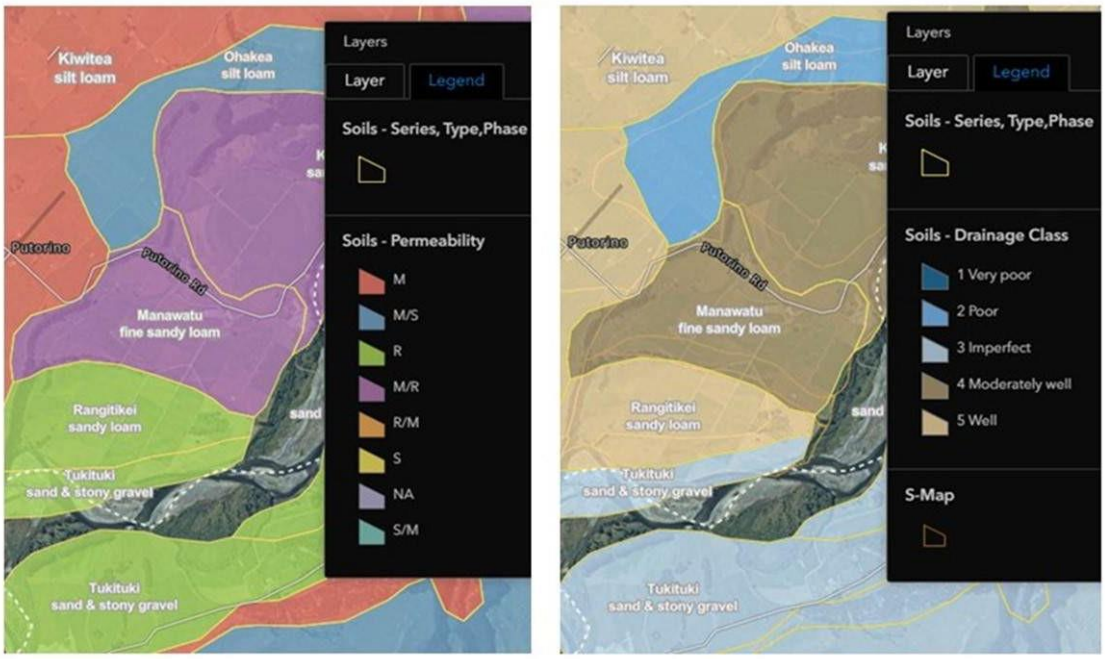
There are separate suite relationships for each of the three LUC legends in our region.



A view of regional scale NZLRI units around a farm. There are three different LUC units shown; 2w2 flats on the wet river silt low terrace with potential for slight streambank erosion, 4e4 strongly rolling loess with potential for moderate to severe sheet erosion under cultivation or intensive winter grazing, and 6e2 on strongly rolling to moderately steep loess with slight soil slip, tunnel gully and sheet under pasture. The potential for sheet erosion under cultivation was not mentioned in the NZLRI units as it is too steep to cultivate. A clear erosion potential can be determined for different slopes using the LUC units. However, paddock scale slope should be used to map risk. See the landforms layer for further guidelines.

How to use the fundamental soil layers to find key regional scale soil properties for defining leaching risk

- Go to the 'Landforms' document for guidance on key soil properties that may be of interest.
- Open the Horizons viewer for FWFP soil and landform information to view the NZLRI fundamental soil layer.
    - Zoom to the extent of map units containing the property/farm
    - Click on the map
    - Alternately turn on and off the appropriate layers as required. The landforms document details the relevant soil properties to check for risk.



This shows a view of the fundamental soil layer permeability (on the left) and soil drainage class (on the right). The soil names are shown as labels. Soil names that contain “stony” or “gravel” and soils with rapid permeability are the most risky for N leaching. Therefore the highest risk soils are the Tukituki sand and stony gravel followed by the Rangitkei sandy loam. See the Landforms document for further guidelines on this.

- Note that the map colours only show colour according to the dominant soil in the map unit. But often the second mapped soil is more important for environmental risk.

- Bear in mind that soil information only tells you about the top 1 to 1.5 metres of soil, but the material below that may be either transmitting, reducing, or eliminating nitrogen through denitrification. Therefore, we recommend also consulting the Landscape DNA website.

If you would like to provide feedback on this document, please email: freshwaterfarmplans@horizons.govt.nz