Ministry for the Environment
Manatū Mō Te Taiao

Method for deriving the stock exclusion low slope land map for the Resource Management (Stock Exclusion) Regulations 2020

December 2022 update

Background

The Resource Management (Stock Exclusion) Regulations 2020 under the Resource Management Act 1991, include reference to 'low slope land'. Low slope land has been specified in the low slope map, which is incorporated by reference in the regulations.

This methodology describes how the stock exclusion low slope land map and associated spatial layer that are incorporated in these regulations have been created.

The following requirements were identified for the low slope land map:

- It must be nationally consistent and must use nationally consistent, freely available input datasets.
- It must reasonably capture all significant areas of low slope land where livestock grazing is likely to occur.
- All land uses need to be included except settlement, recognising that the layer needs to show where the stock exclusion rules would apply regardless of the current land use (for example, plantation forestry).
- Lakes and ponds, as defined in the Land Cover Database (LCDB5) are to be removed from the layer, recognising that it is unlikely that this area will ever be converted to grazing land.

The first version of the low slope land map was published in 2020. It included all land parcels with an average slope of 10 degrees or less. Several shortcomings were identified with this version of the map including that:

- it captured significant areas of land over 10 degrees in slope owing to the land parcel averaging approach
- it did not capture land consistently, owing to the wide variation in the size of rural land parcels

- it captured some areas of extensive high-country grazing land where there were unique challenges to excluding stock from waterways such as reticulated water supplies freezing in winter.

To address these issues, a new methodology for creating the low slope land map was developed. It incorporated the following key differences:

- Instead of averaging slope over land parcels, a local terrain averaging approach was used, creating a map that more closely followed the contours of the land.
- Land over 500m in altitude was excluded to remove high-country farms.
- The slope threshold was reduced to 5 degrees, with the intention that the area between 5 and 10 degrees would be managed, with consideration of local context, through freshwater farm plans.

Source data sets

The primary dataset required to create the low slope land map is a digital elevation model (DEM). The DEM needed to balance providing a fair representation of the contour of the landscape without providing so much detail that the average slope measurements are unreasonably inflated. It also needed to be available across the entire extent of Aotearoa New Zealand. This requirement precluded the use of a LiDAR-derived DEM.

The elevation model used was the best available to the Ministry for the Environment: the Manaaki Whenua – Landcare Research 15m resolution DEM derived from LINZ 20m contour data. This elevation model, which was hydrologically enforced using the River Environments Classification (REC) dataset, was developed to provide good estimates of slope and aspect for topographically correcting satellite imagery. The focus on slope accuracy makes this DEM ideal for this application. The entire list of data sets used create the LSL map are listed in table 1.

Table 1: Source data sets used to create the stock exclusion low slope land map 2022

Name	Source	Date accessed
Manaaki Whenua Landcare Research (MWLR) 15m digital elevation model (GRS80)	This DEM was produced by Manaaki Whenua with a focus on getting good slope and aspect information for use in topographic correction of satellite imagery. The algorithm used to build this DEM used the River Environments Classification (REC) dataset to enforce hydrology. The version used was based on the GRS80 ellipsoid.	Held by the Ministry for the Environment since 2008
Regional Council Boundaries	Stats NZ Regional Council Clipped (generalised) Boundaries (2020): https://datafinder.stats.govt.nz/layer/104253-regional-council-2020-clipped-generalised/	21 May 2020
Land Cover Database 5	National land cover map available from Landcare's LRIS portal: https://lris.scinfo.org.nz/layer/104400-lcdb-v50-land-cover-database-version-50-mainland-new-zealand/	30 January 2020
River Environments Classification 2 (Version 4)	NIWA: https://niwa.co.nz/freshwater/management-tools/river-environment-classification-0	12 June 2019

Methodology

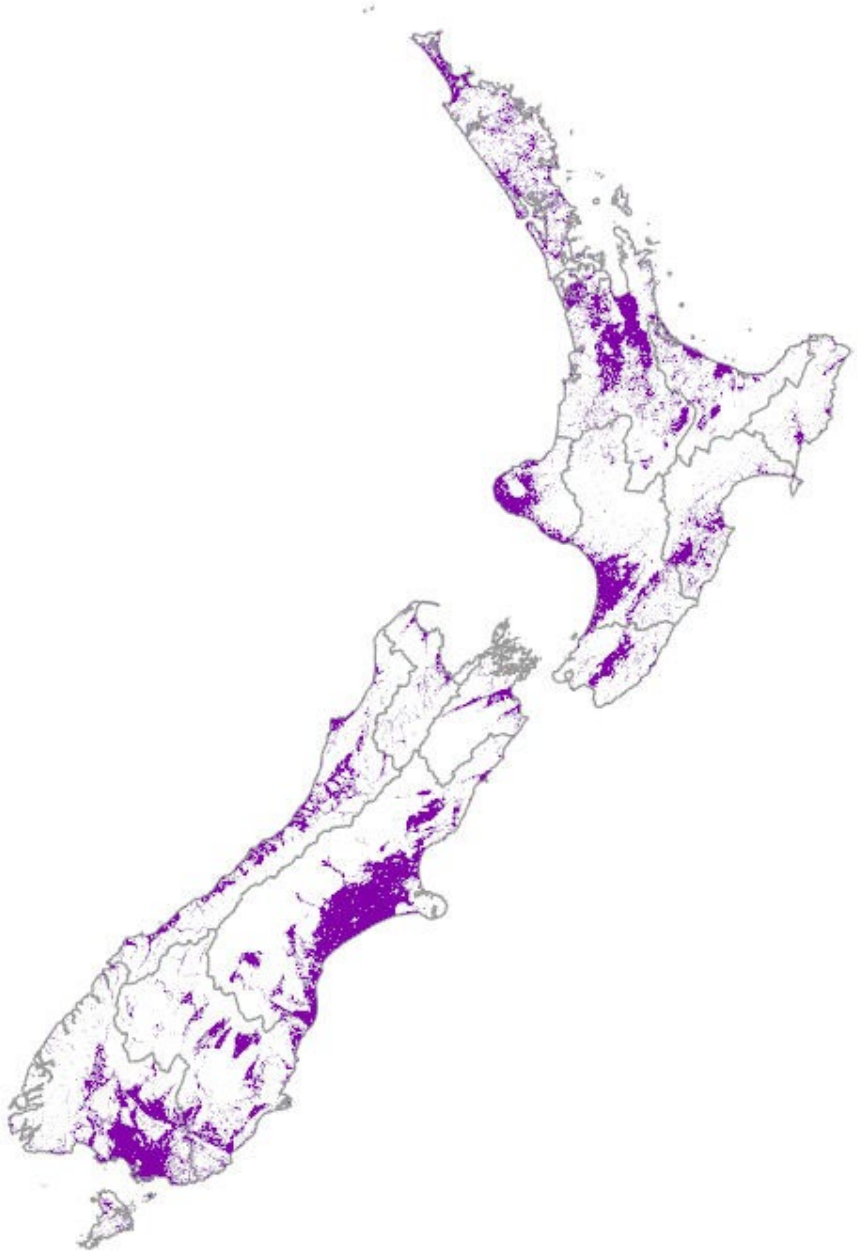
The general steps in the geoprocessing methodology were as follows:

1. Starting with LCDB5, an exclusion layer of the built-up areas, open parkland, transport infrastructure, lakes and ponds and estuarine open water was created (LCDB5 Exclusion Layer).
2. A 500m height mask was created from the Manaaki Whenua - Landcare Research 15 Digital Elevation Model (500m Mask).
3. The slope layer was calculated in degrees from the MWLR DEM using ERDAS Imagine.
4. The slope layer was thresholded to 5 degrees and majority filtered with a 3x3 filter (5 Degree Slope Layer).
5. The resulting 5 Degree Slope Layer was smoothed and simplified.
6. The LCDB5 Exclusion Layer and 500m Mask were erased from the 5 Degree Slope Layer.
7. Holes under 2 hectares in size were filled in and polygons under 2 hectares in size were deleted to further simplify the map.
8. Polygons that did not intersect, or were within 5m of, a REC 2 river reach were deleted to remove low slope plateau areas.

The resulting map, called the stock exclusion low slope land 2022 map, updates and replaces the original low slope land map published in 2020. The 2022 map is illustrated in figure 1 and in the stock exclusion low slope land viewer – December 2022.

A similar method was used to create the stock exclusion medium slope land 2022 map, which shows land with slopes between 5 and 10 degrees. The area covered by this map is not part of the low slope land as incorporated by reference in the Resource Management (Stock Exclusion) Regulations 2020. Rather, it is provided to guide planning of additional areas where it may be appropriate to exclude stock from waterways.

Figure 1: Stock exclusion low slope land 2022 layer



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