

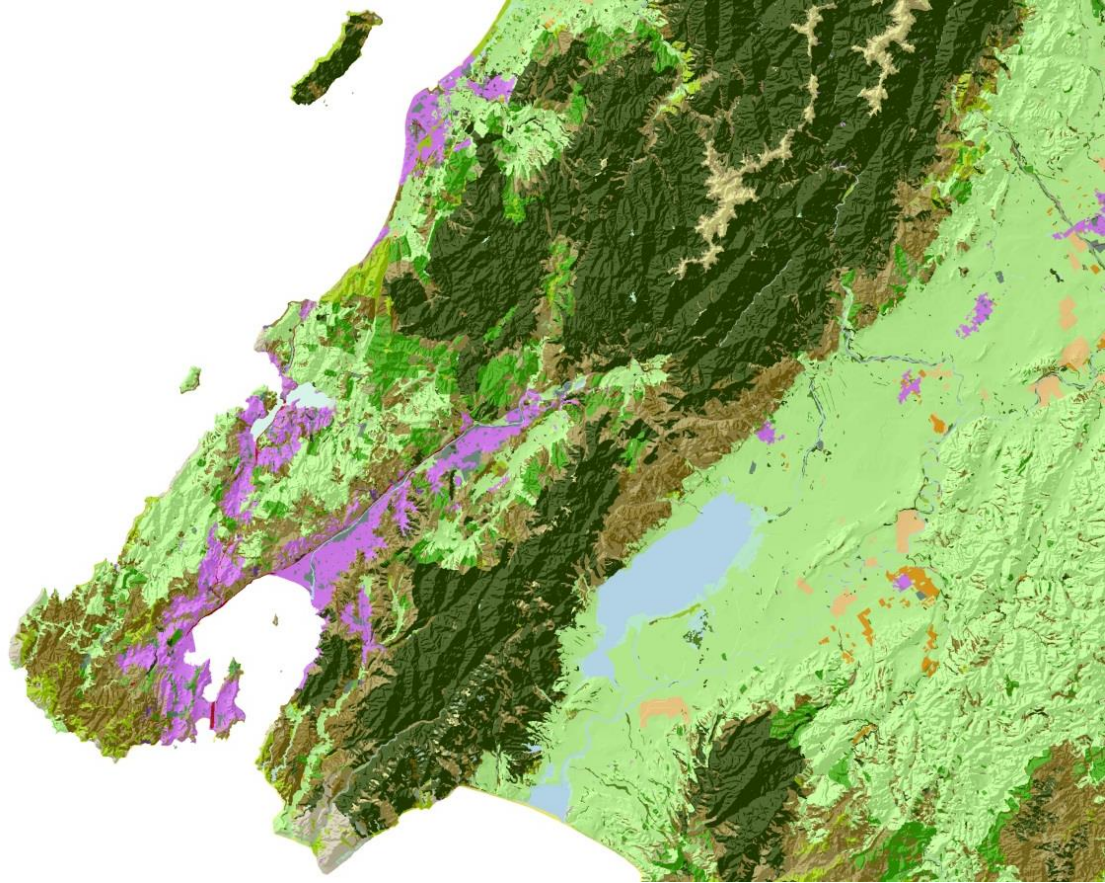


Landcare Research
Manaaki Whenua

Time and Trees on the Map
Land Cover Database 4

Talk Outline

- Key steps producing
 - LCDB v3.0, v3.3 & v4.0
- What's planned in v4.1
- Applications using LCDB
- Data quality feedback
- Research results
 - Satellite data processing
 - Timed mosaics
 - Smart polygon editing
 - LiDAR
- Research direction
- Beyond current contract

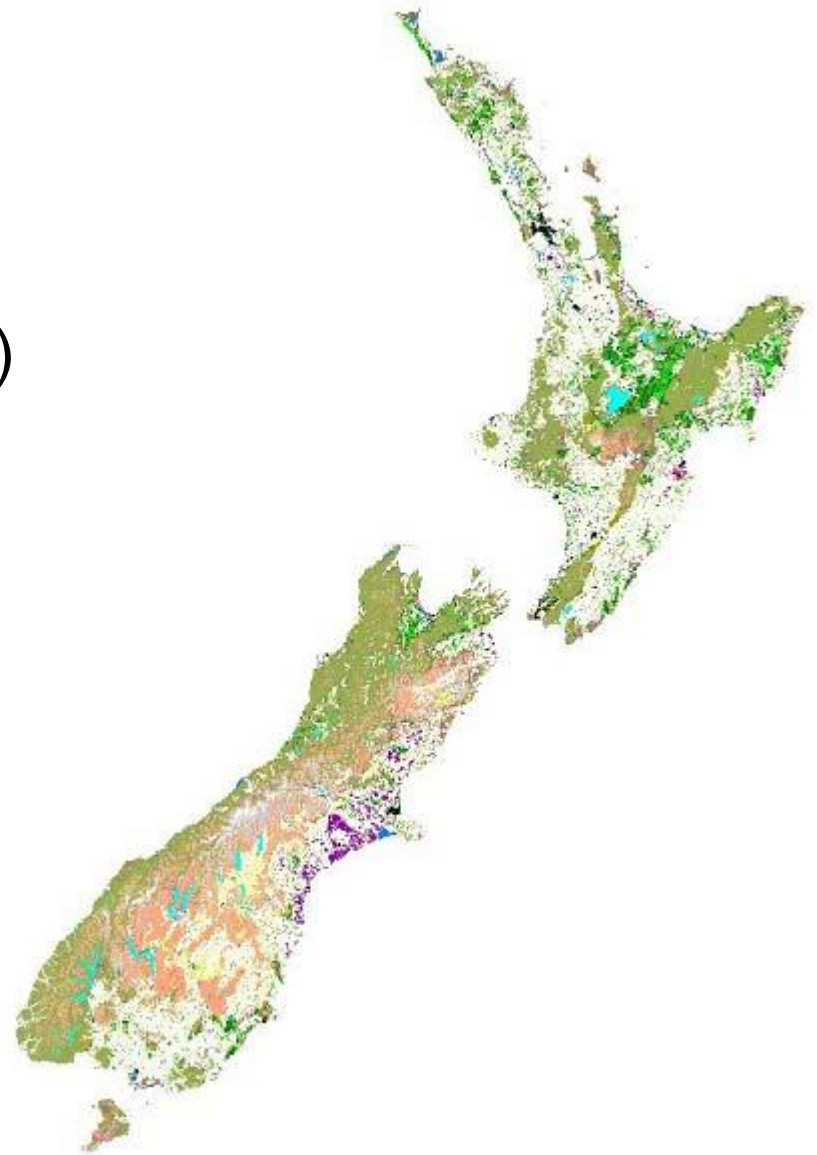


Looking Back...

LCDB v2 Inheritance:

- 43 Land Cover Classes
- Two time steps (1996, 2001)
- 428,000 polygons
- Supporting imagery

Our task was to take custody of this database, improve it, and deliver two further time steps (2008, 2012). Also, to develop processes to make this sort of mapping more efficient in future



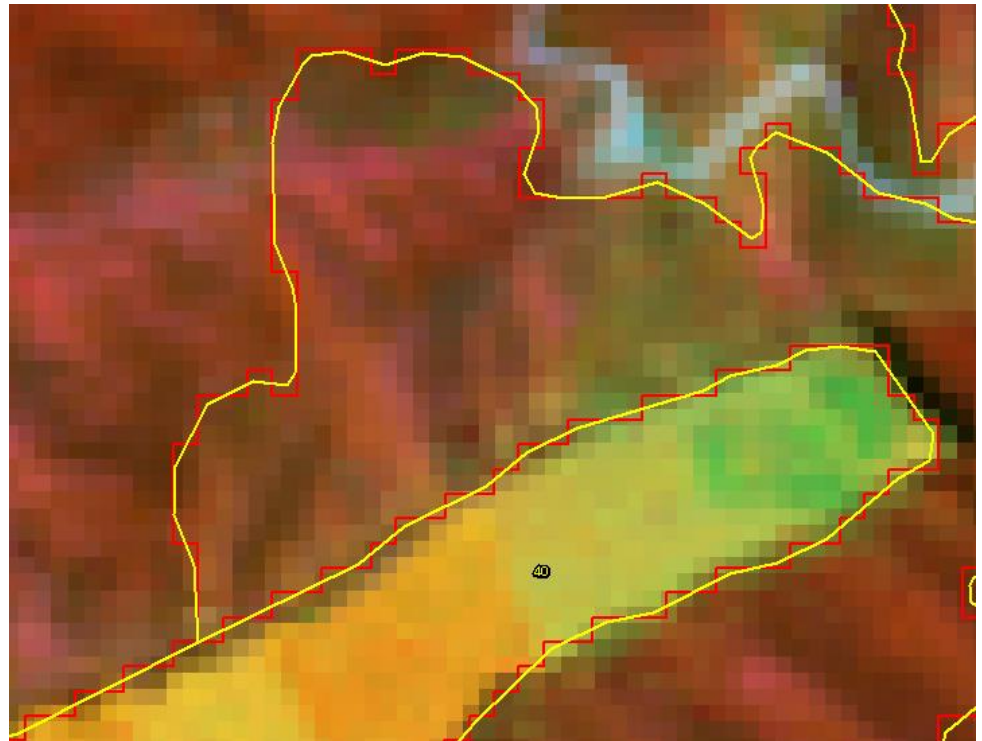
First Steps...

De-clutter, by:

- Removing Regions & Districts → down to 403,000 polys
- Eliminating ($<0.05\text{ha}$) fragments → down to 340,000 polys
- Smoothing line-work

None of these altered the land cover map, but the next steps would.

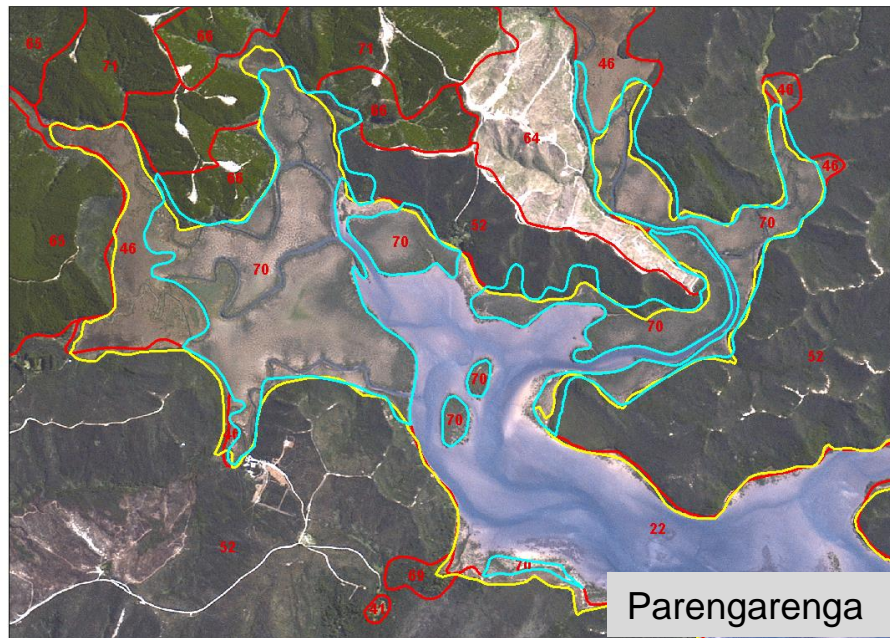
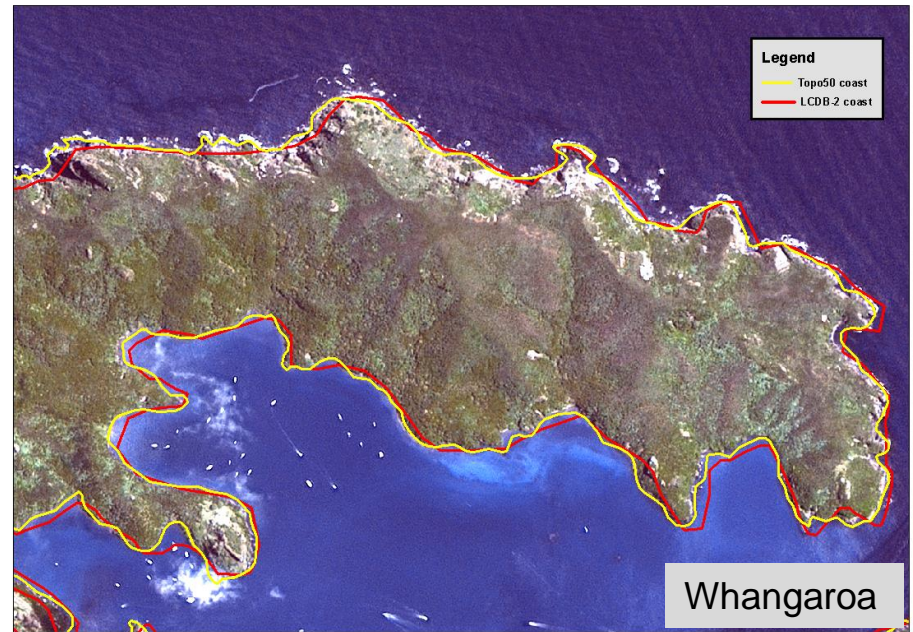
Stakeholders & our advisory group were party to all these decisions...



Next Steps...

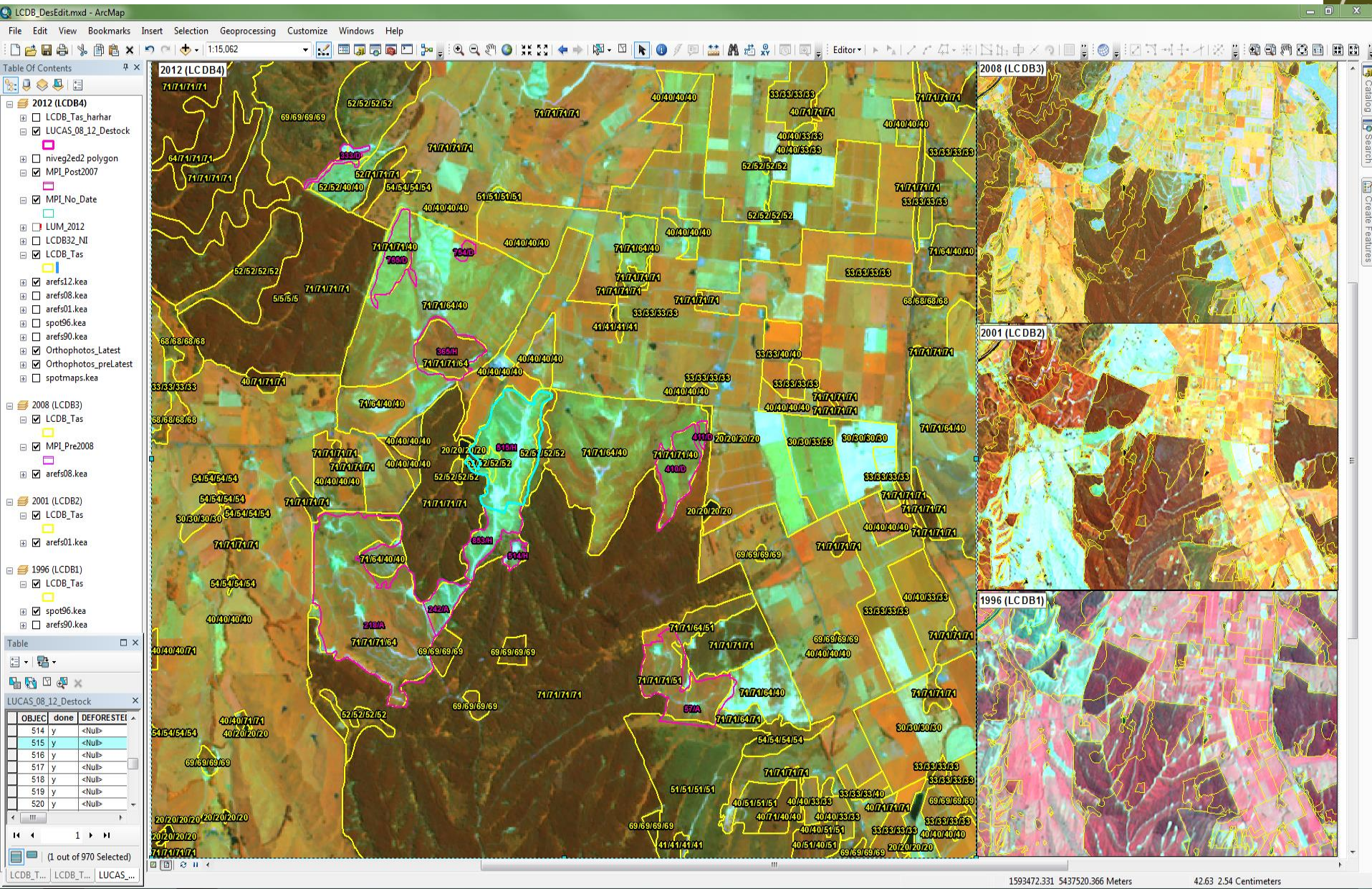
- Rationalise classification
 - → down to 33 classes
- Rationalise coastline
 - → unify with Topo50
- Offshore vegetation
 - ↓

	LCDB v2 class	LCDB v3 class
Bare or Lightly-vegetated	Coastal Sand and Gravel	Sand and Gravel
	River & Lakeshore Gravel and Rock	Gravel and Rock
	Landslide	Landslide
	Alpine Gravel and Rock	Permanent Snow and Ice
	Permanent Snow and Ice	Alpine Grass/Herbfield
	Alpine Grass/Herbfield	



→ created an 'onshore' attribute

LCDB Mapping Environment (using ArcGIS)



Mapping processes 2011-2014 (LCDBs v 3.0-4.0)

2011-12

- Restructure database
- Rubber-sheet offset areas
- Change 2001-08
- Harvesting c2008
- 2001 harvesting review

LCDB v3.0

2012-13

- >20ha change review
- Crop/settlement update (ex LUM)
- SI grassland errors
- SI grassland improvement 2001-08
- User-notified corrections

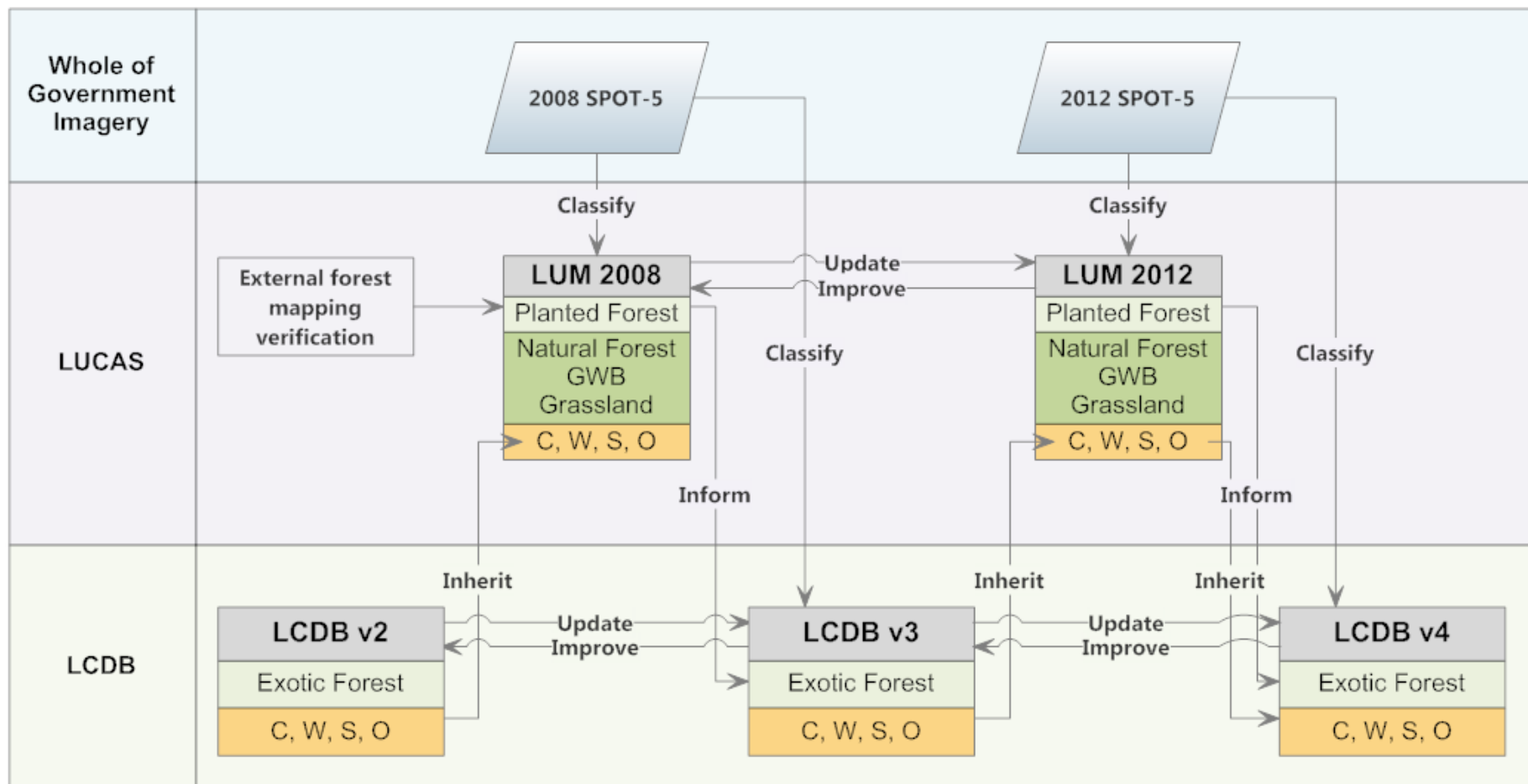
LCDB v3.3

2013-14

- Wetland upgrade (5½ regions)
- QA error corrections
- Change 2008-12 (ex LUM)
- Forest de-stock c2012 (harvest/deforest, ex LUM)
- 2008 harvesting review
- Urban update (ex LINZ)
- Local 'green fields' improvement
- User-notified corrections (e.g. Geographx)

LCDB v4.0

LCDB and LUCAS-LUM harmonisation



Note: C, W, S, O = Cropland, wetland, Settlements, Other.

Looking ahead...

2014-15

- Accuracy assessment
- LCDB/LUM class matrix corrections
- Chatham Islands
- User corrections
- More wetlands (3-4 regions?)
- Woody-on-pasture features?
- Rewrite User Manual...?

LCDB v4.1

2015-?

- LCDB v5... when?
- Classification review (rationalise/subdivide classes)?
- Mapping fidelity review?
- Integrate with LUM?
- ...?

LCDB Applications

National Reporting



MfE
MPI...

Environmental Research



NIWA
Cawthron
Aqualinc
Freshwater Sol'n
Plant & Food
Scion...

Environmental Protection



Doc
Rural Fire
Regional Councils...

Smart Business



Atlas
EcoFX...

Better Maps



LINZ
Geographx
Ngai Tahu
Regional Councils...

Data Quality Feedback

- Formal error feedback

- Improved engagement
- Trackable, Updatable

Full instructions on LCDB site and LRIS portal

The screenshot shows the LRIS portal interface. The main content area displays the 'LCDB v4.0 - Land Cover Database version 4.0' page. The page includes a map of New Zealand, a search bar, and a detailed description of the database. A pop-up window displays metadata for a selected area, including coordinates, date, and land cover class.

LCDB v4.0 - Land Cover Database version 4.0
LCR / Informatics Team

About | Metadata | Data Table | Analytics | History | Services | Comments (0) | [Submit feedback](#)

The New Zealand Land Cover Database (LCDB) is a multi-temporal digital thematic map of land cover and land use. Land cover at each of four periods: summer 1996/97, summer 2001/02, summer 2008/09, and summer 2012/13, is both delineated and classified. The land cover classification evolved over the first three periods but compatibility has been maintained. The current version, LCDB v4 (and its predecessor LCDB v3), contains 33 classes. The classification used in LCDB v3 and v4 can be found in the document [LCDB v3 Correlation Table](#) pdf along with the correlation from the classification used in the earlier version (LCDB v2). This document is available as an attachment to this dataset in the LRIS portal ([lrinfo.scinfo.org.nz](#)), and on the LCDB project site ([www.lcdb.scinfo.org.nz](#)). The LCDB was designed to be compatible in scale and accuracy with Land Information New Zealand's 1:50,000 topographic database. The LCDB is intended for use in areas such as state of environmental monitoring, forest and shrub inventory, biodiversity assessment, trend analysis and infrastructure planning. LCDB v4.0 was released in June 2014 and includes non-temporal edits to the 1996/97, 2001/02, and 2008/09 time periods along with new mapping of change up to the summer 2012/13 period. A change layer, 'LCDB v4.0 change' is available to indicate both non-temporal and temporal changes made between LCDB v3.3 and LCDB v4.0. The non-temporal changes include error in earlier mapping. An 'authority' attribute is also available in this layer acknowledging the source of the latest mapping of both non-temporal and temporal change. The Chatham Islands, which were not yet been re-mapped in LCDB v4.0, are available in the LCDB v4.0 change layer. The LCDB v4.0 change layer is available in the LCDB v4.0 change layer. The LCDB v4.0 change layer is available in the LCDB v4.0 change layer.

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You must attribute the creator in your own work

Attachments
1. SPOTS Ortho Final Report (28 July 2009)
2. Illustrated Classes LCDB2
3. LCDB2 3CorrelationTable
4. LCDB v3 Land Cover Legend

Information
Category: Beta > Ecology > Ecological parameter > Land cover
Tags: 1996, 2001, 2008, 2012, agriculture, Alpine Grass/Herbfield, Broadleaved indigenous

Metadata Pop-up:

WET_CONTEXT	no
Onshore	yes
LCDB_UID	lcdb2000210615
EditDate	2011-06-30
Shape_Leng	923.690200905
Shape_Area	27946.7989352
EditAuthor	Landcare Research
Class_1996	71
Class_2001	71
Class_2008	71
Class_2012	71
Name_1996	Exotic Forest
Name_2001	Exotic Forest
Name_2008	Exotic Forest
Name_2012	Exotic Forest

Data Quality Feedback

- Information sought
 - Confirm dates (don't rely on background image)
 - Provide evidence; screenshots, pictures, documents

Submit feedback on LCDB v4.0 - Land Cover Database version 4.0

Subject: Incorrect LCDB classification for 2008 and 2012?

Feedback on: LCDB v4.0 - Land Cover Database version 4.0

☒ WET_CONTEXT

Onshore	yes
LCDB_UID	lcdb2000210615
EdtDate	2011-06-30
Shape_Leng	923.690200985
Shape_Area	27946.7889352
EdtAuthor	Landcare Research
Class_1996	71
Class_2001	71
Class_2008	71
Class_2012	71
Name_1996	Exotic Forest
Name_2001	Exotic Forest
Name_2008	Exotic Forest
Name_2012	Exotic Forest

☒ Include other map information

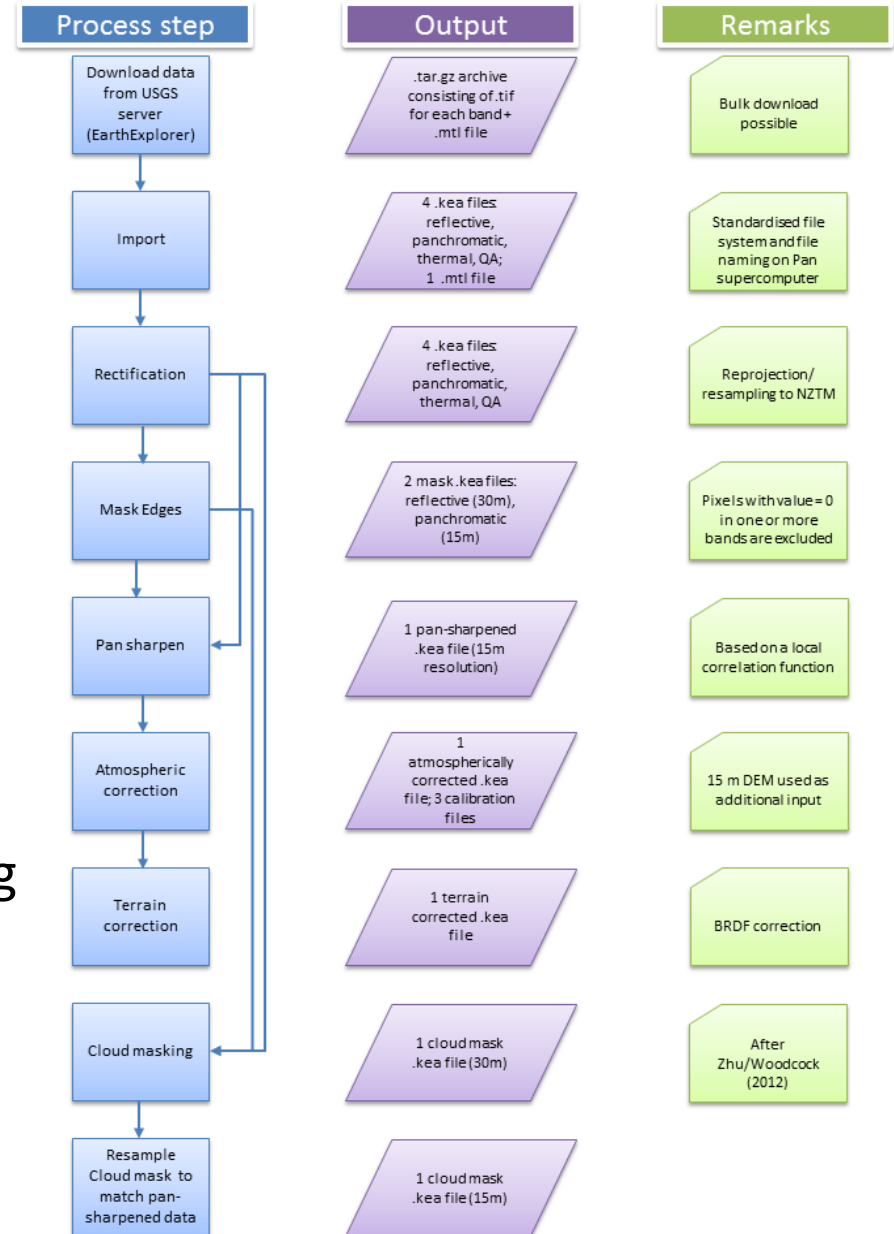
Description: The pine trees in this polygon were felled prior to April 2007 (see attached image from Google Earth) and the LCDB classification for this polygon in 2008 and in 2012 should therefore be low producing pasture.

Attachments: Google hawea 16 2 2007

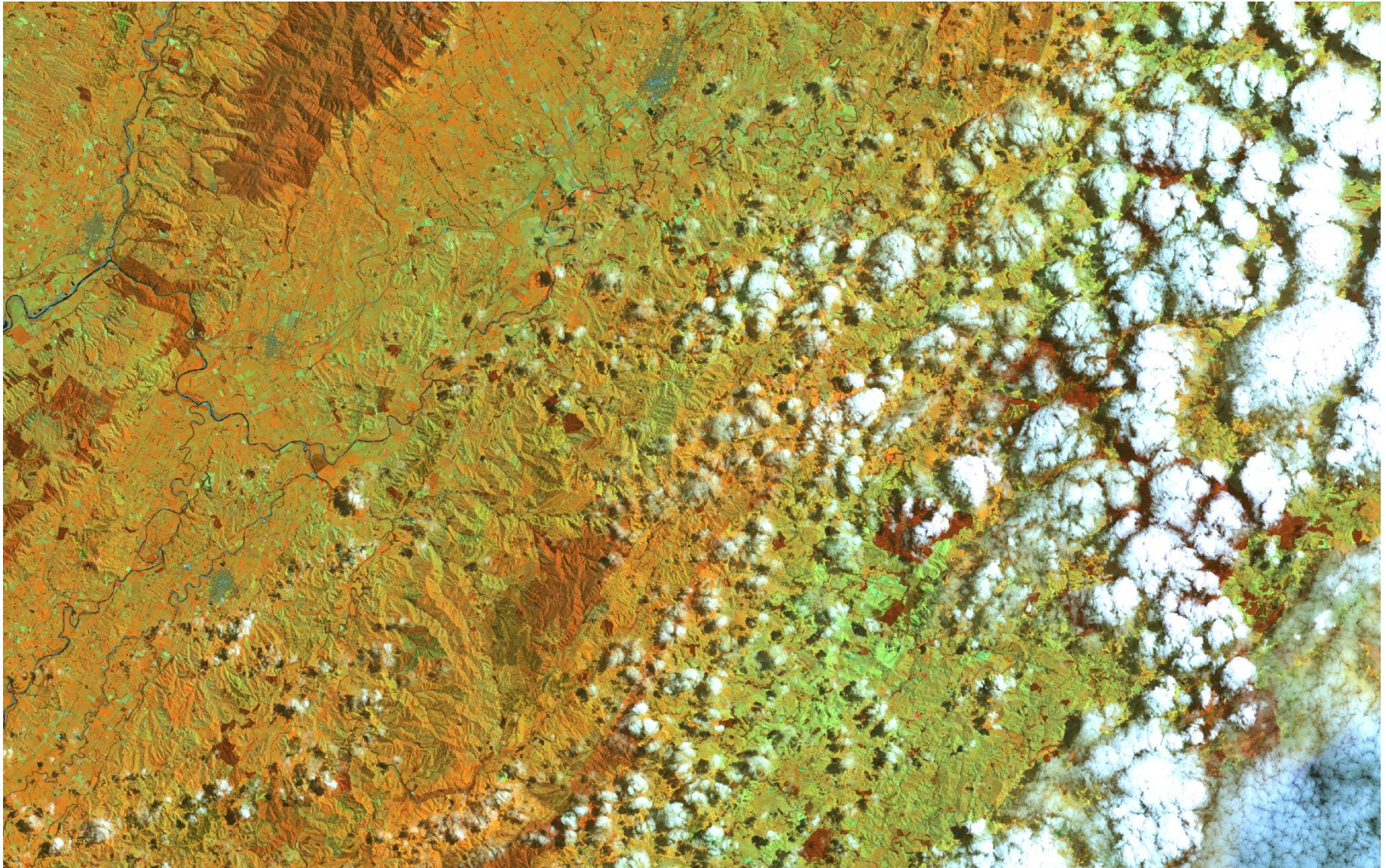
LCDB v4.0 - Land Cover Data	
WET_CONTEXT	no
Onshore	yes
LCDB_UID	lcdb2000210615
EdtDate	2011-06-30
Shape_Leng	923.690200985
Shape_Area	27946.7889352
EdtAuthor	Landcare Research
Class_1996	71
Class_2001	71
Class_2008	71
Class_2012	71
Name_1996	Exotic Forest
Name_2001	Exotic Forest
Name_2008	Exotic Forest
Name_2012	Exotic Forest

Satellite data processing – HPC workflows

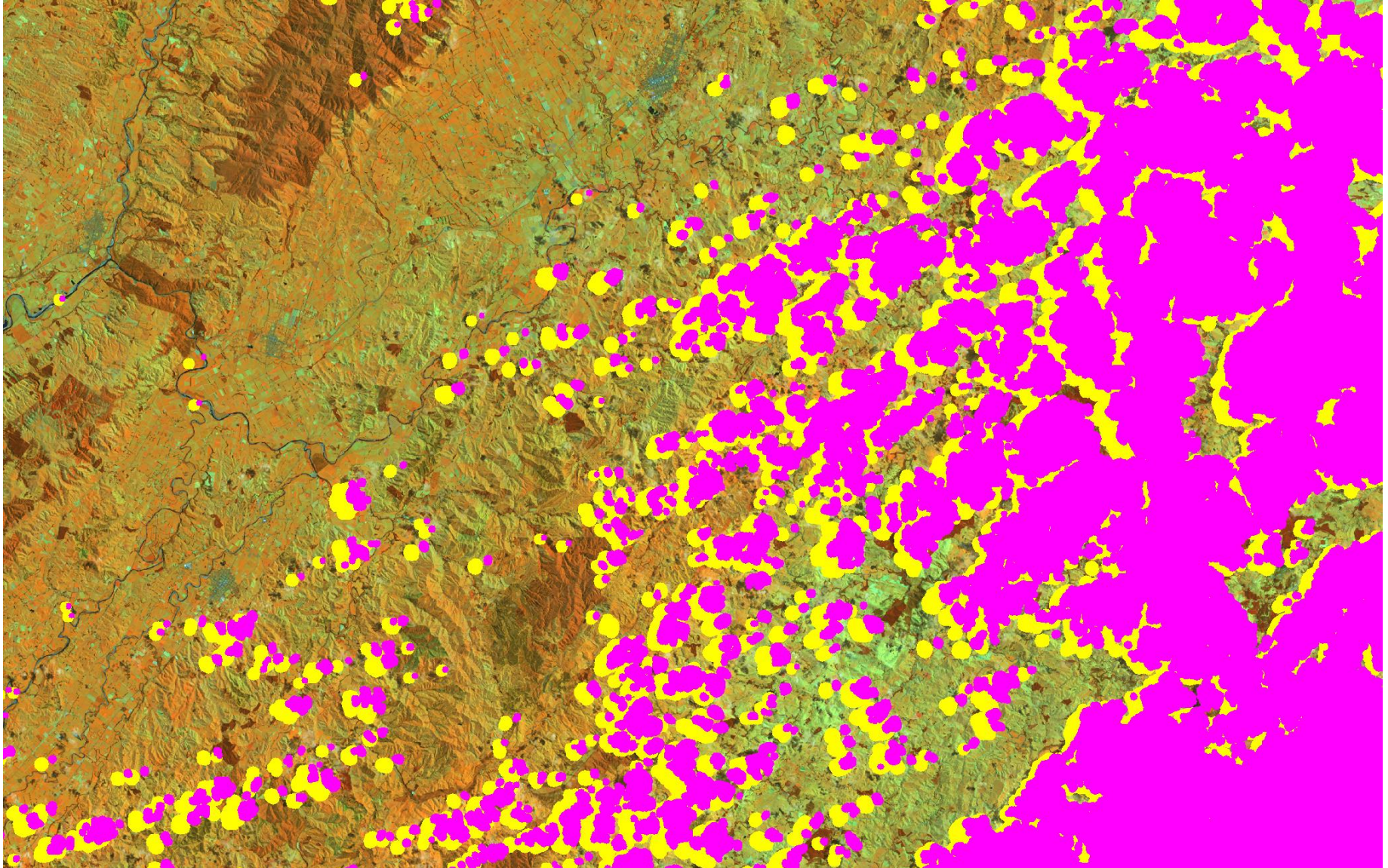
- Very automated
- Produces
 - Cloud masks
 - Calibrated imagery
 - Flattened imagery
- 1600 Landsat-4,5,7,8
 - 4.8 TB
- Temporal trend
 - **Much** more data (free)
 - Different approach to processing
 - e.g. better cloud clearing
 - Lots of opportunities
 - Future LCDB



Satellite data processing – Cloud clearing

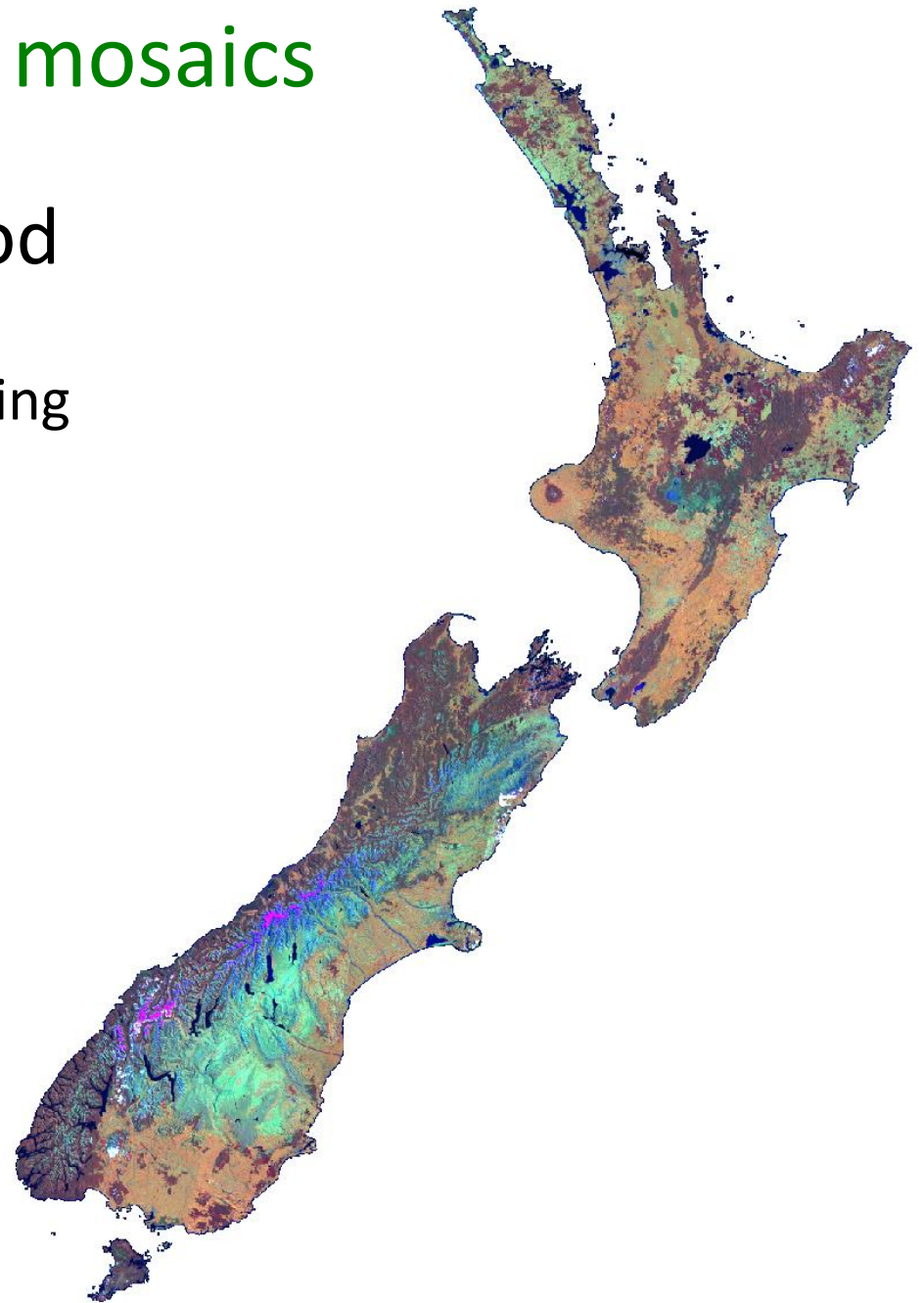


Satellite data processing – Cloud clearing

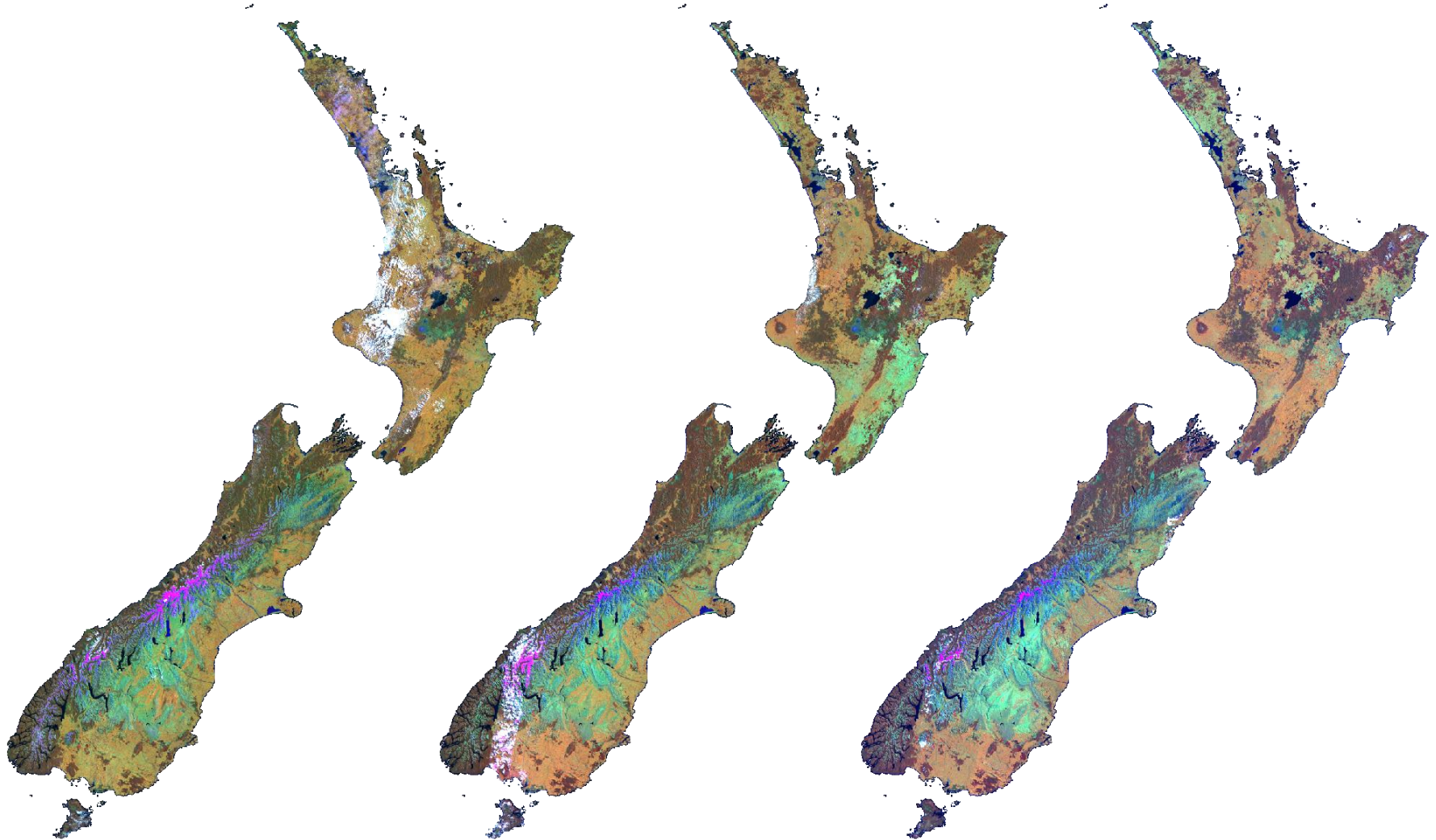


Timed mosaics

- Select over limited period
 - Rank images
 - Mosaic on cloud masks/ranking
- Uses
 - Enhance phenology
 - Report specific period



Timed mosaics



2011/12
Oct 11 – Feb 12

2012/13
Oct 12 – Feb 13

2013/14
Nov 13 – Feb 14

Timed mosaics – control masks



137
Landsat 7
SLC-off scenes

178
Landsat 7
SLC-off scenes

146
Landsat 8
scenes

Smart polygon editing

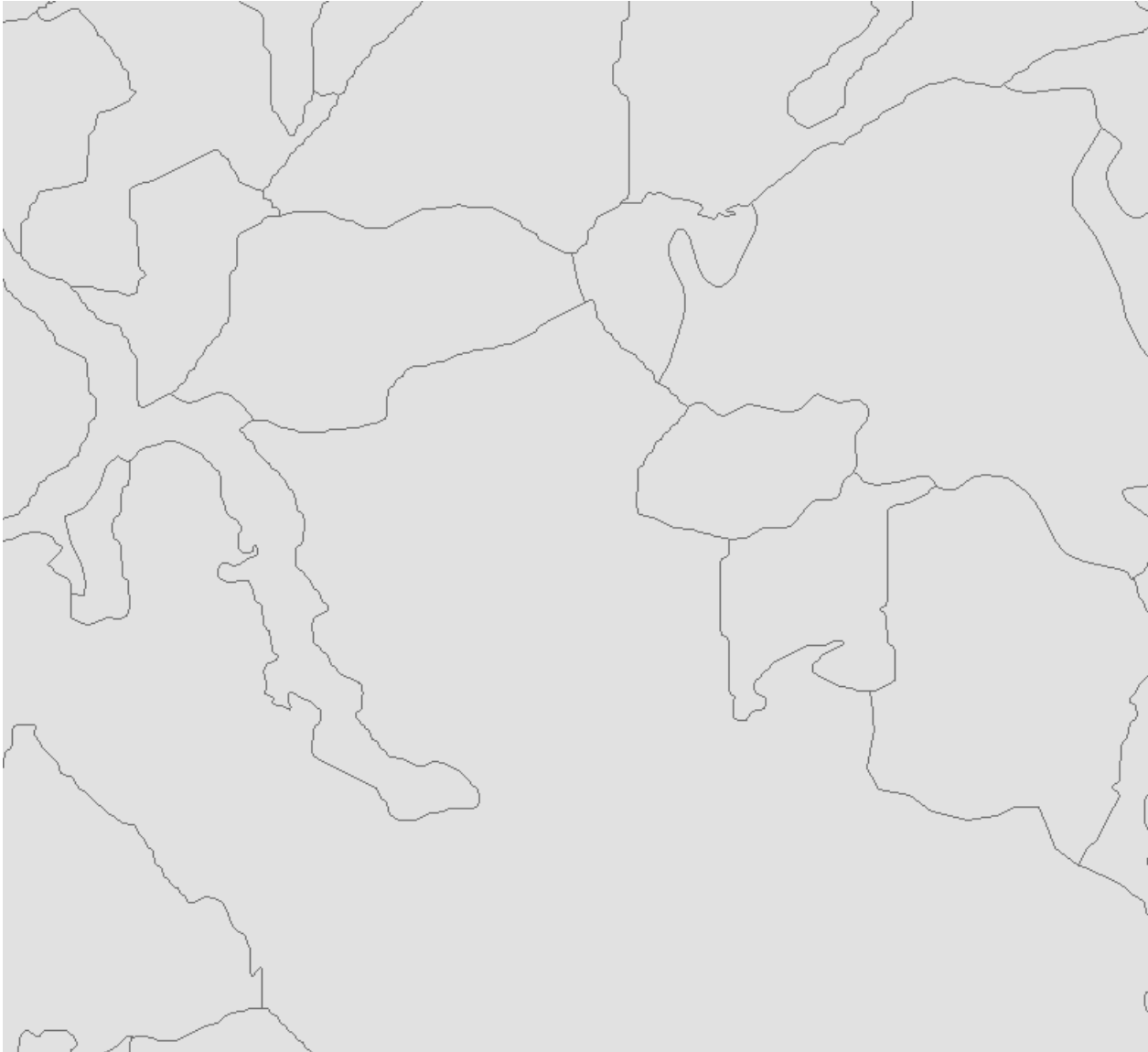
- Semi-Automated method to integrate
 - Change polygons (from remote sensing)
 - Replacement polygons (e.g. from another dataset)
- Select, Insert, Clean
 - across wide area (very confident of results)
 - Screen at a time (operator keeps track of results)

Smart polygon editing – LCDB v3.3

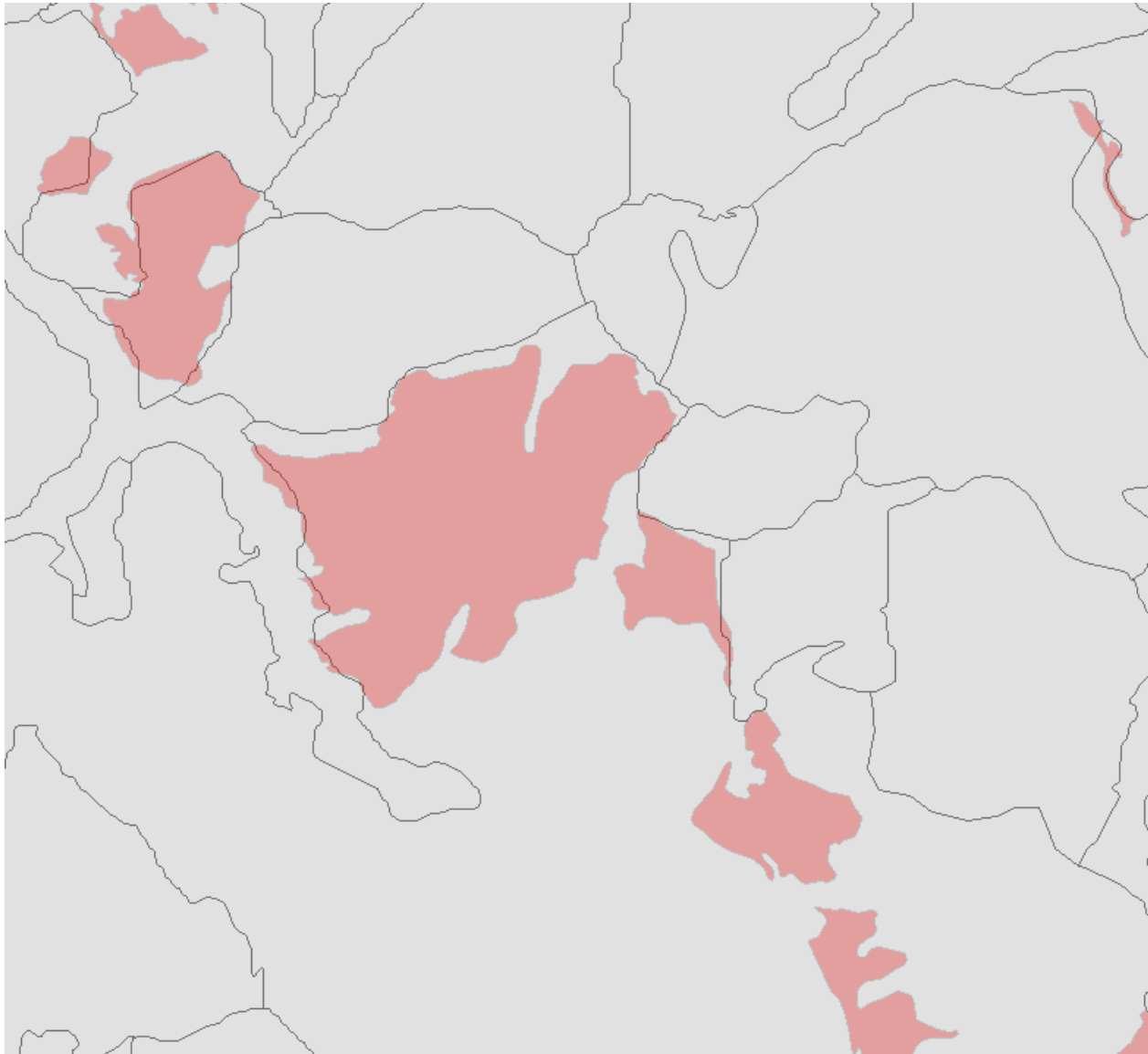


- Exotic
- Indigenous
- Broadleaf
- Gorse
- Manuka
- Pasture low
- Pasture high

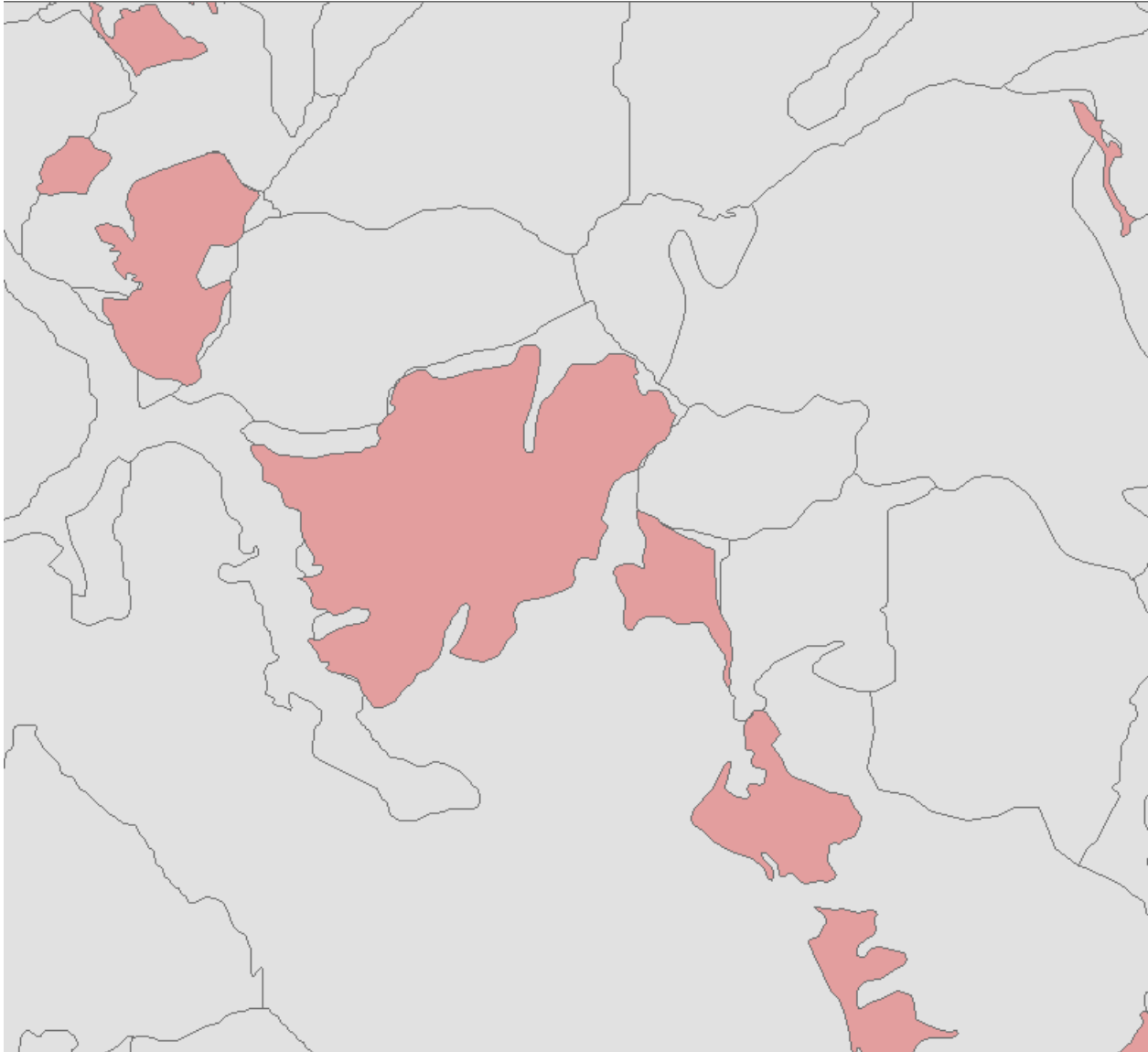
Smart polygon editing



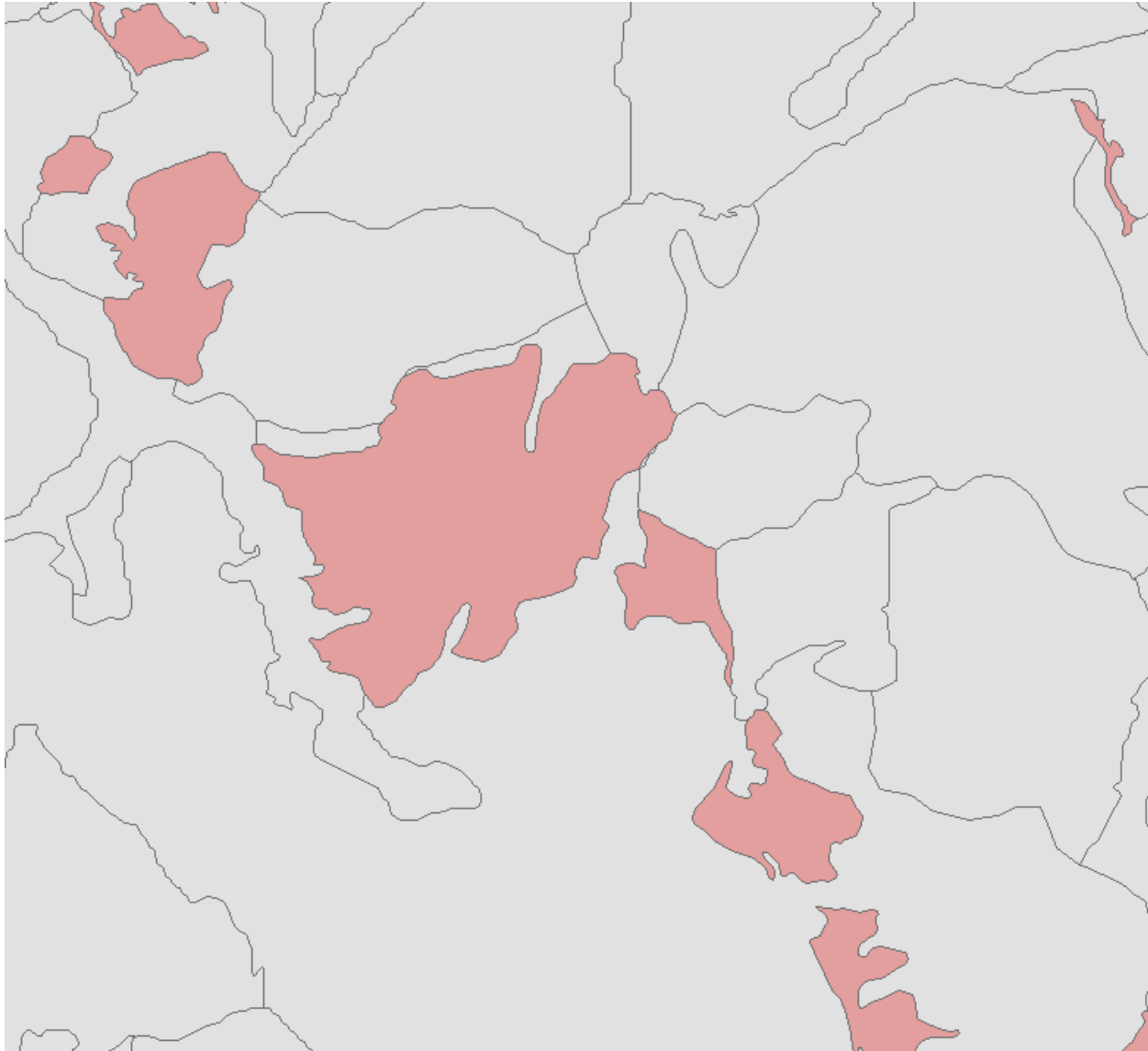
Smart polygon editing – change polygons



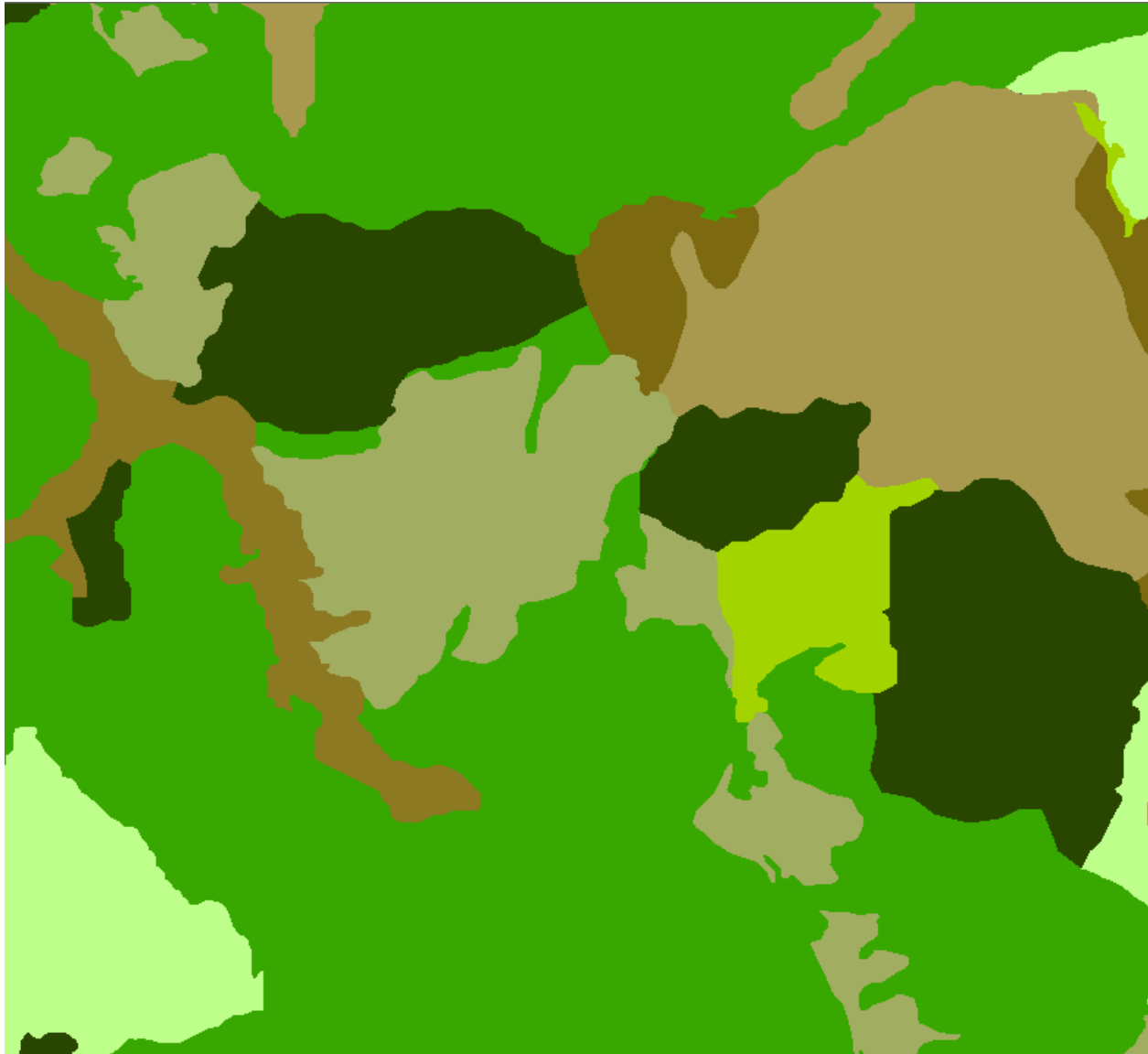
Smart polygon editing – burnt



Smart polygon editing – cleaned



Smart polygon editing – cleaned



- Exotic
- Indigenous
- Broadleaf
- Gorse
- Manuka
- Pasture low
- Pasture high
- Harvested

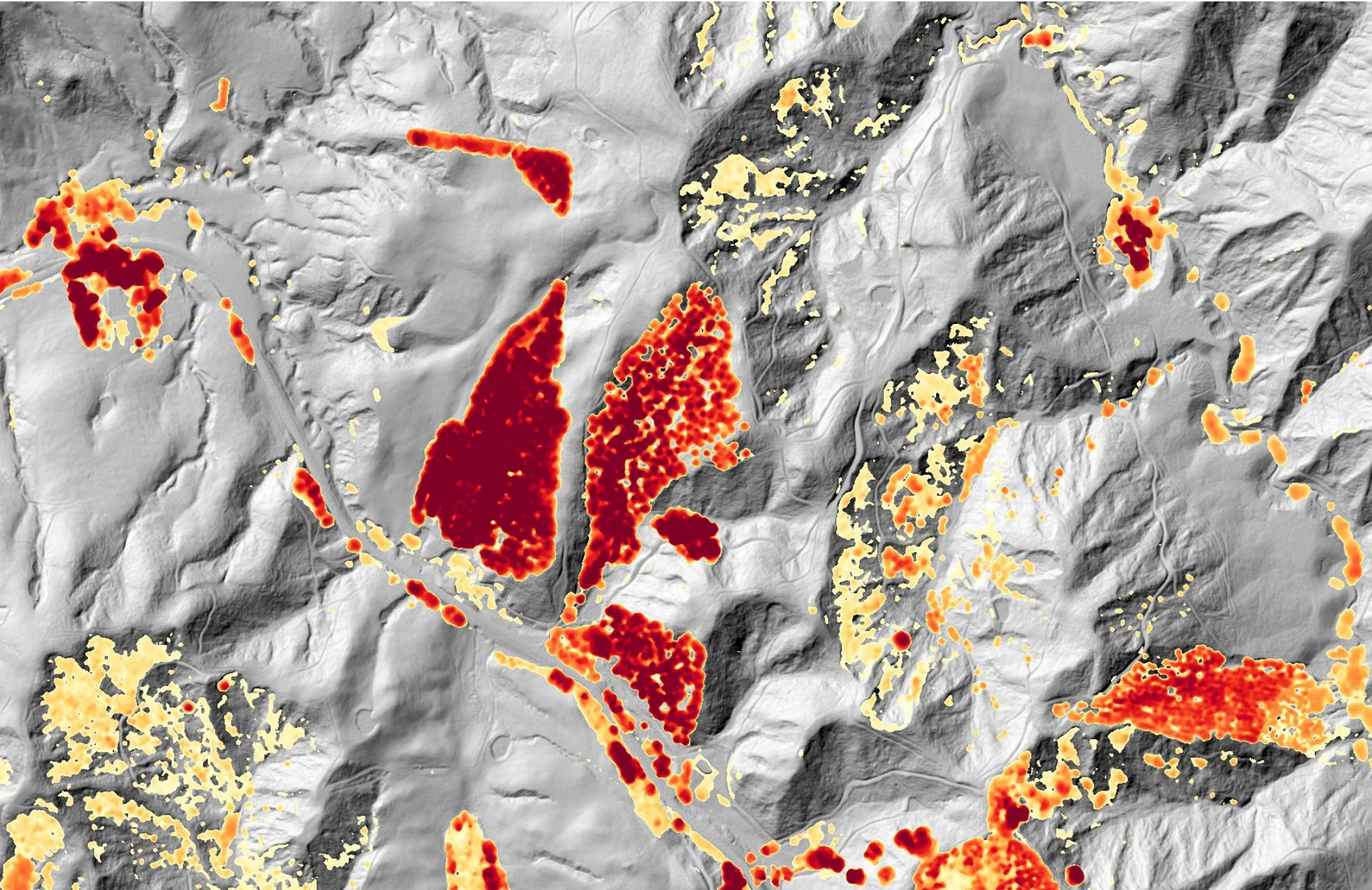
LiDAR Processing / Research



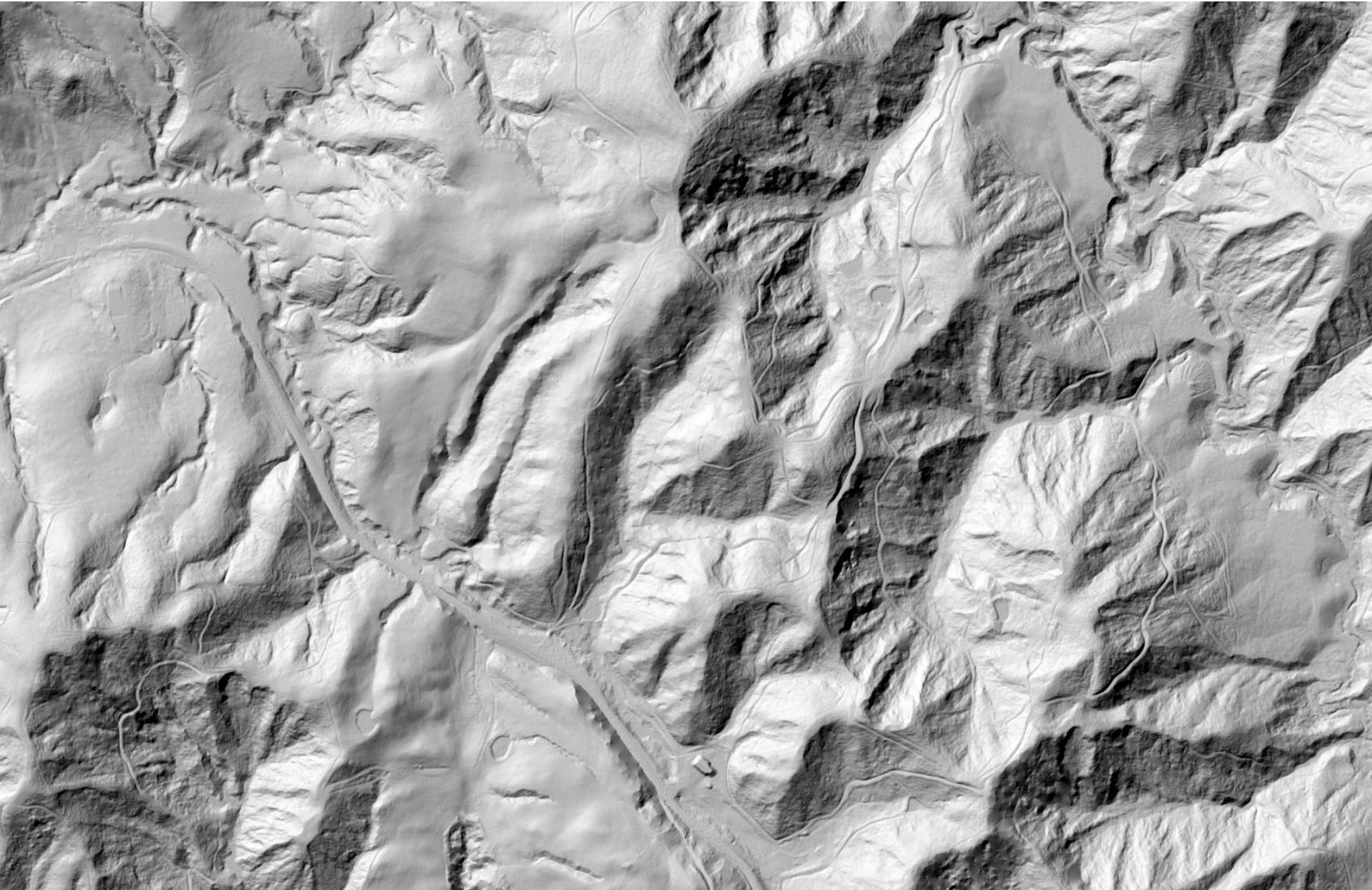
Wellington survey - colour aerial



Canopy height and DEM



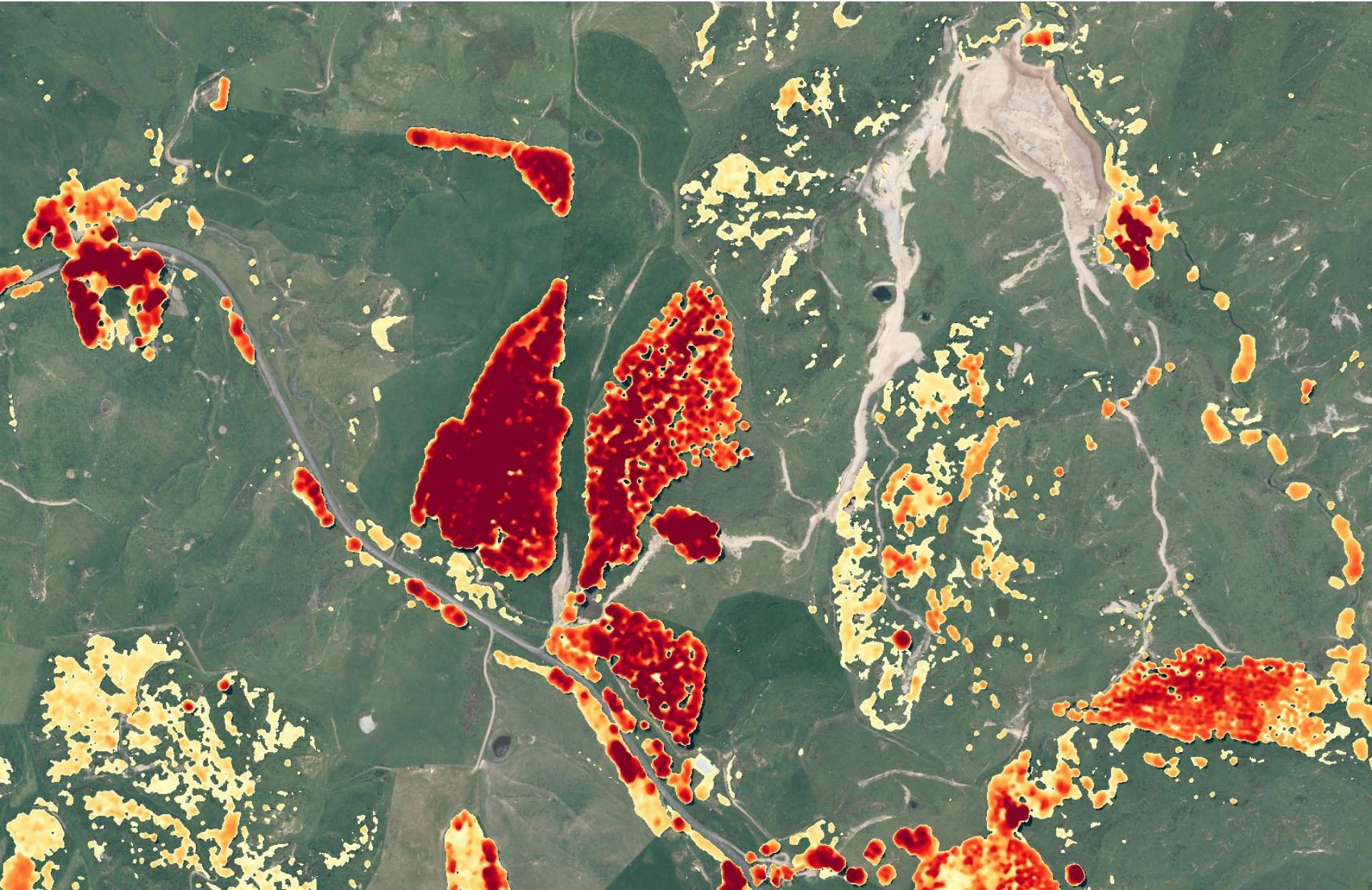
Wellington survey - DTM



Wellington survey - colour aerial



Wellington survey - canopy height



Research directions – this year

- Accuracy assessment
 - Paper on appropriate use
- Improve woody patches (from radar)
- Regional assessment of smart-editing
 - semi-automated LCDB update 3 -> 4
- Indigenous forest Alliances from LiDAR
 - Structures, Carbon, Large Trees

Beyond current contract

- Land use inference from land cover
 - External datasets (RS and other)
 - Sub-classification or attribution; not necessarily in LCDB itself
 - E.g. pasture → irrigated; or dairy
 - Indigenous forest → forest alliances (29)
 - LCDB/LUM integration
- Support new satellites
 - Workflows – image pre-processing
 - Inter-calibration / extend slope, sun angle envelope

Summary

- LCDB v4.0 and how did we get here
- How is it used and by who
- Selected research results
- Immediate future
 - LCDB v4.1
 - Research
- Beyond the current contract

A close-up, slightly blurred photograph of a dense field of wheat. The stalks are a mix of golden-brown and light green, indicating they are ripe but still have some moisture. The lighting is soft, creating a warm, textured appearance. The word "Questions?" is centered in the middle of the image in a bright green, sans-serif font.

Questions?