

GlobalSoilMap.net

[glö'bal soll mæp dot net]



Oceania Node: progress towards multi-functional soil information

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Launch of the Global Soil Partnership's Asia Soil Science
Network and GlobalSoilMap.net East Asia Node

8-11 February, 2012, Nanjing, China

National Research
FLAGSHIPS

Sustainable Agriculture



CSIRO

Introducing Oceania Node of GlobalSoilMap

Collaborative group of soil science institutions who are building the GlobalSoilMap grid for the countries of the Pacific, New Zealand, Australia, Papua New Guinea, Timor Leste and Indonesia

Coordinated by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and including the leading soil science agencies in the region

Develops *GlobalSoilMap.net* through

- collaboration,
 - capacity development,
 - shared experience and skills and
 - joint approach to funding and support.
- All are agencies with a much broader interest in soil issues – and are looking for the advance in capability and utility that GlobalSoilMap promises
 - Have agreed to a Memorandum of Understanding which outlines the terms of collaboration and engagement

Current institutions

The University of Sydney, Australia

Lead contacts: Alex McBratney, Budiman Minasny

Pacific nations – SPC – Land Resources Division

Lead contact: Inoke Ratukalau

CSIRO, Australia

Lead contacts: Mike Grundy – Node leader

Landcare Research, New Zealand

Lead contact: Allan Hewitt – Science Coordinator

Indonesia – Indonesian Center of Agricultural Land Resources Research and Development

Lead contact: Dr Muhrizal Sarwani

PNG and Timor Leste – to be discussed

Outline

Brief re-visit - to avoid fatigue for those who have been here before!

Then:

Themes – building a multifunctional system:

- Collage: a collage in many dimensions - country down to project level
- Diversity – the many paths in action – and what drives the choice of path
- Engagement – building a path between soil survey and data collection and the GSM product
 - With an enhancement, improvement cycle
 - Partnerships – in Oceania. A challenge to get all parties; and engagement within country
- The components – ensuring appropriate investment in each part of the system

Highlights and emerging opportunities

Soil and related issues

- **Indonesia:**

- Uncontrolled Conversion of paddy field (1-1.5% / year), & threat of planned conversion of paddy field (42%)
- Availability vs Need for Land and national priorities: Food Self Sufficiency (Maize, Soybean, & Sugar),
- Stress from climate variability & change (Global Warming)
- Agricultural Land Degradation and environmental aspects (pollution, etc)
- Loss of potential land (forest and cultivation) which is displaced and degraded



- **New Zealand:**

- Understanding and managing the effects of increasing intensity of land use
- Understanding and managing the relationships between soil use and water quality.
- Accurate understanding and modelling of N, P and C cycles.
- Erosion management in soft rock hill country.

And underpinning all that - the need to capitalise on much investment in the development of management tools by providing accurate soil information inputs

- **Australia:**

- Understanding and managing the key degradation processes: soil acidification, wind and water erosion, soil carbon loss, salinisation
- Improving and maintaining agricultural productivity
- Reducing the loss of nutrients and sediments from land and the effects on key natural assets eg. Great Barrier Reef
- Improving resource use efficiency in soils – water, nutrients, energy, land
- Improved understanding of the place of key soil attributes in ecosystem functioning
- Filling the key information gaps with the right sort of soil information



Secretariat of the Pacific Community

- Food and nutritional security
- Integrated and sustainable agriculture and forestry
 - focus on forests and the benefits for soil, biodiversity, land protection
- Participatory 'landcare' and enhanced traditional farming systems
- Fertiliser efficiency
- Special focus on 'atoll agriculture' – poor soils and climate change effects
- e-Agriculture – improve the information movement to and across agriculture (ITC developments, role of smart phones etc)
 - Pacific soils portal



How we work:

- Memorandum developed and agreed – in process of signing
- Collaborative based around shared capacity development and an agreed workplan:
 - Training at various levels including regional Universities (coordinated by The University of Sydney), training workshops, secondments, multi-disciplinary projects;
 - A diverse funding model with each partner in the Node working separately or collaboratively to ensure a sustainable financial base for the project;
 - Shared access to and development of information technology;
 - A joint Node approach to the development of the overall *GlobalSoilMap* concepts including the working groups and the specifications;
 - A diverse approach to communication and information about the project and its products – relevant to local, regional and global audiences; and
 - Interaction with the various users of the information

The emerging Themes: Collage

Artists and children understand the craft of collage – building a coherent picture from disparate components

Oceania is disparate:

- Geographically
- Environmentally
- And in the soil information we inherit and from which we aim to deliver fine scale, specific attributes and the certainty with which we know them – the coherent picture

As in collage – the final overall picture is crucial

- Those who use soil information don't understand and struggle to use the bits and pieces – they need the coherent picture
- Not the bits and pieces



An area of good consistent mapping

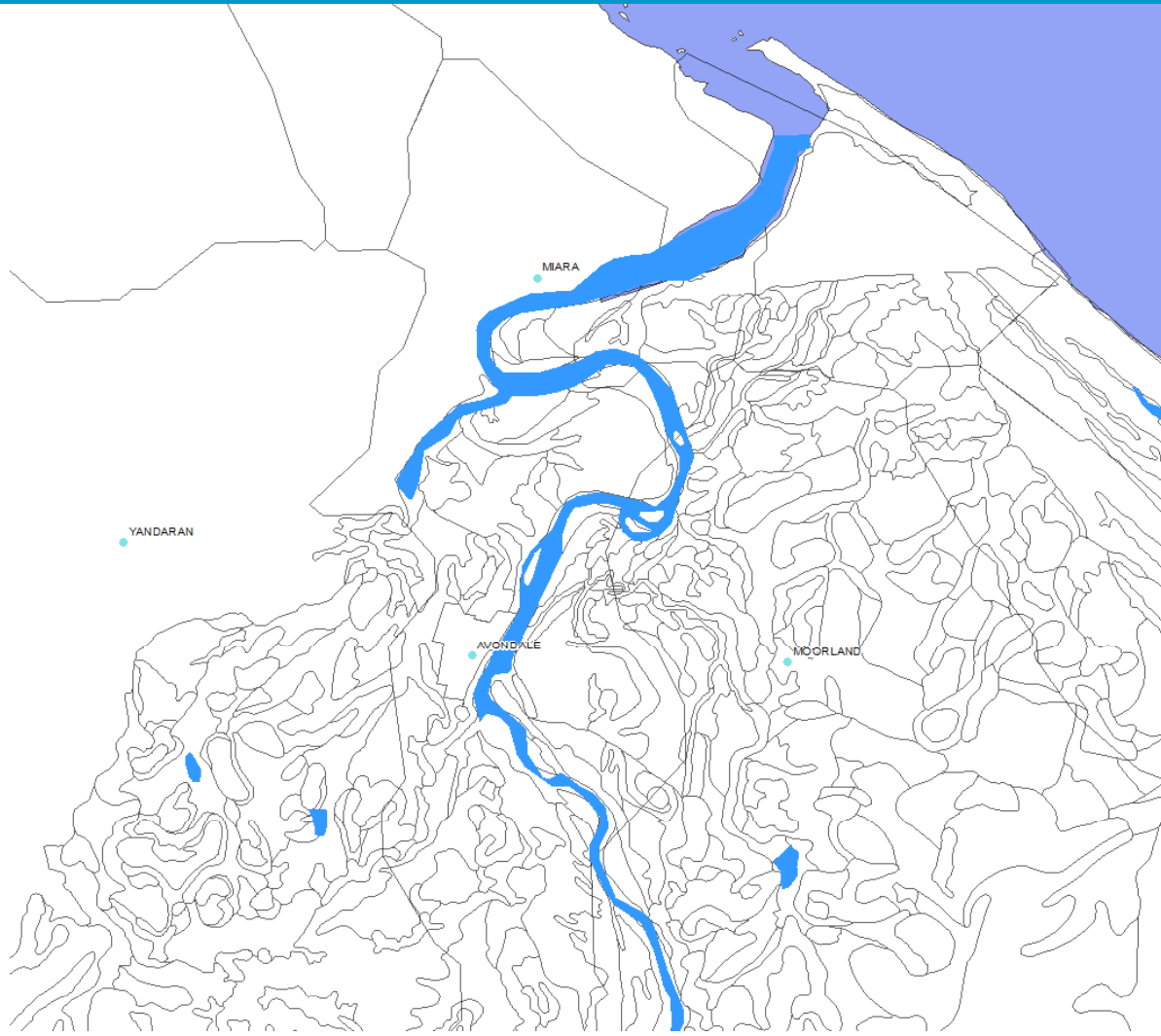




0 339 678 1356 2034 2712 Metres

An all too common extreme case





Diversity

- GlobalSoilMap has always known that we need a diversity of approaches – but a consistent and understandable product
 - The legacy information diversity
 - The covariate diversity
 - The skills diversity
 - The funding diversity

Engagement

GlobalSoilMap is not and can not be 'top down'!

A 'top down' approach can produce a product – but we aim for a system which :

- Is connected to the existing and developing information base and those who care for it
- Engages a broad suite of users demanding this information
- Is part of the overall soil information system and can therefore be systematically improved

We need to cultivate broad ownership

Within the Node and constituent members

Within countries and across key institutions

In Oceania – this requires nested responsibility
and adequate funding

Components

Necessary components for a sustained systems approach:

- Information system design
 - Ensures connectivity and sustainability if done well
 - Includes specifications of other data systems, geographic context and so on
 - Locally – targeted version of the GlobalSoilMap specifications
- Soil data collation, data enhancement
- Covariate specification, preparation and enhancement
- Core estimation tasks – may include a number in a collage approach
- Uncertainty estimation and communication
- Inference and decision support systems:
 - To ensure that the users get the information they need
- Delivery and access systems – supplemented with relevant support
- Training of soil scientists and soil information users
- Communication and engagement

Some highlights

Funding

- Secured for version 1 of GlobalSoilMap in Australia
- Secured for version 1 for parts of New Zealand and for the integration of GlobalSoilMap into the national system
- Set aside for the Pacific Soils Portal in the South Pacific
- Not yet secured for Indonesia?

Not yet secured for Oceania as a whole BUT there are promising signs!

- While we have been working on this:
 - University of Sydney has developed and run training courses
 - CSIRO has funded Oceania Node establishment activities

New Zealand notes

New Zealand:

- Landcare Research has established the centre of activity for GlobalSoilMap and S-map (the national soil information system)
 - National Land Resources Centre (NLRC)
 - S-map and GlobalSoilMap within New Zealand are now integrated into one project with two sets of over-lapping outputs – aimed at both the national goal and contributions to the node and international effort.
- Current GlobalSoilMap focus:
 - Digital soil mapping of soft rock hill country has commenced and will produce GlobalSoilMap surfaces
 - GlobalSoilMap surfaces emerging from current soil carbon research
 - Carbon, bulk density, total N
 - Based on national surfaces derived from regression krigging (Stephen McNeill).



S-mapOnline

Fast, simple access to New Zealand soils data



Landcare Research
Manaaki Whenua

- Home
- Getting Started
- About
- Map
- Factsheets
- Glossary
- Terms of Use
- Data Provenance

Tools

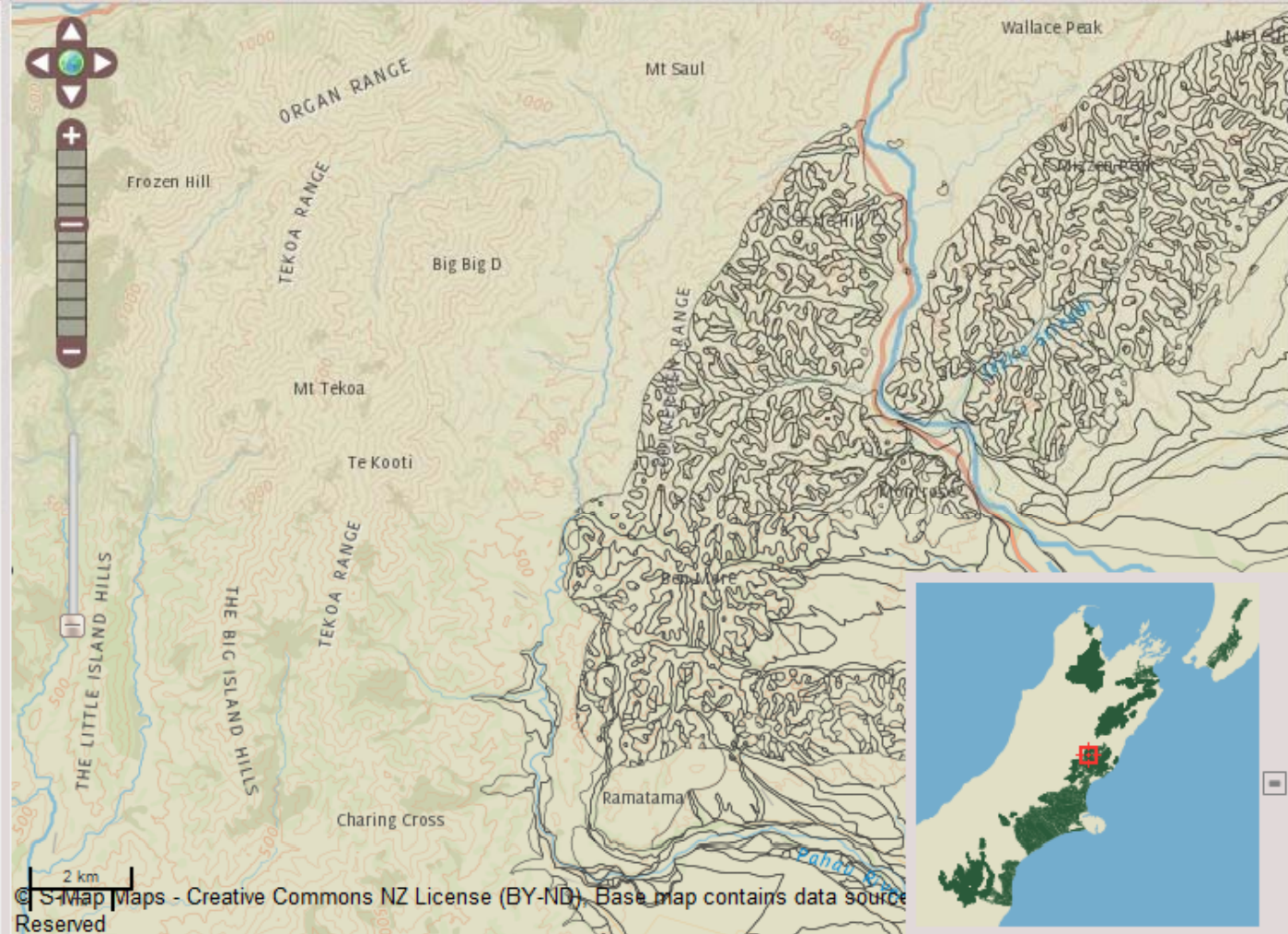
- Navigate
- Zoom Box
- Feature Information
- Scale: 1 : 100,000
- Start Again
- Print
- Help

Location Search

Search for a place (e.g. *Papamoa*) or enter a [latitude-longitude](#) or [NZTM](#) coordinate (e.g. -37.73, 176.29 or 1890671, 5819114).

Layers

- Labels, hydrology and roads
 - Cartographic Text
 - Transport
 - Water Group
- Soils
 - S-map Polygons & Labels
 - Soil Drainage
 - Very Poorly Drained
 - Poorly Drained
 - Imperfectly drained
 - Moderately well drained
 - Well drained
 - Depth To Hard Soil / Gravel / Rock
 - Soil Moisture - Profile Available With
- Basemap
 - Simple Coastal Outline
 - Monochrome Terrain Map
 - Landcover Terrain Map
 - Monochrome Topographic
 - Colour Topographic



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Australian experience in building version 1

The team:

Systems design:

Covariates:

National data collation

Inference and pedotransfer

Communications

Estimation activities

Central concept of the project:

- Improve ecosystem research and understanding in Australia

 - obtain the best possible grid of the specified attributes

 - connect to national effort in soil survey and soil information

 - build the capacity to improve the grid

 - inform the development of new national soil survey activities

The suite of activities serve this end.

Australian experience in building version 1

The team:

Goes across Federal and State agencies, CSIRO, Univ Sydney

Systems design:

Modelling the complexity – to produce apparent simplicity!

Developing around an experience information modeller

Australian version of the specifications – and the extras needed

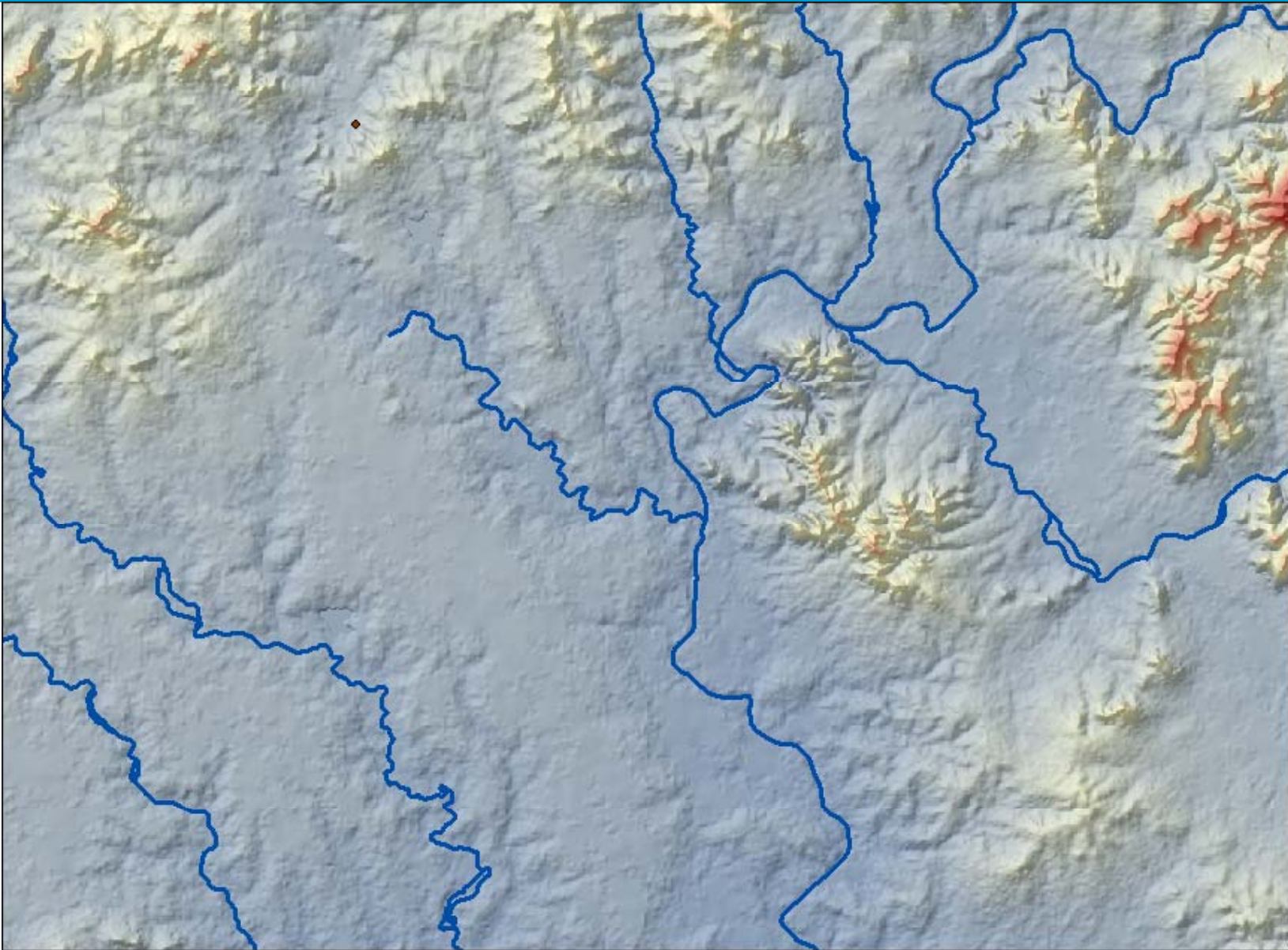
Covariates:

new attributes drawn from 1 arcsec SRTM DEM now available
including an experimental landscape pattern attribute; current focus
on more complex attributes

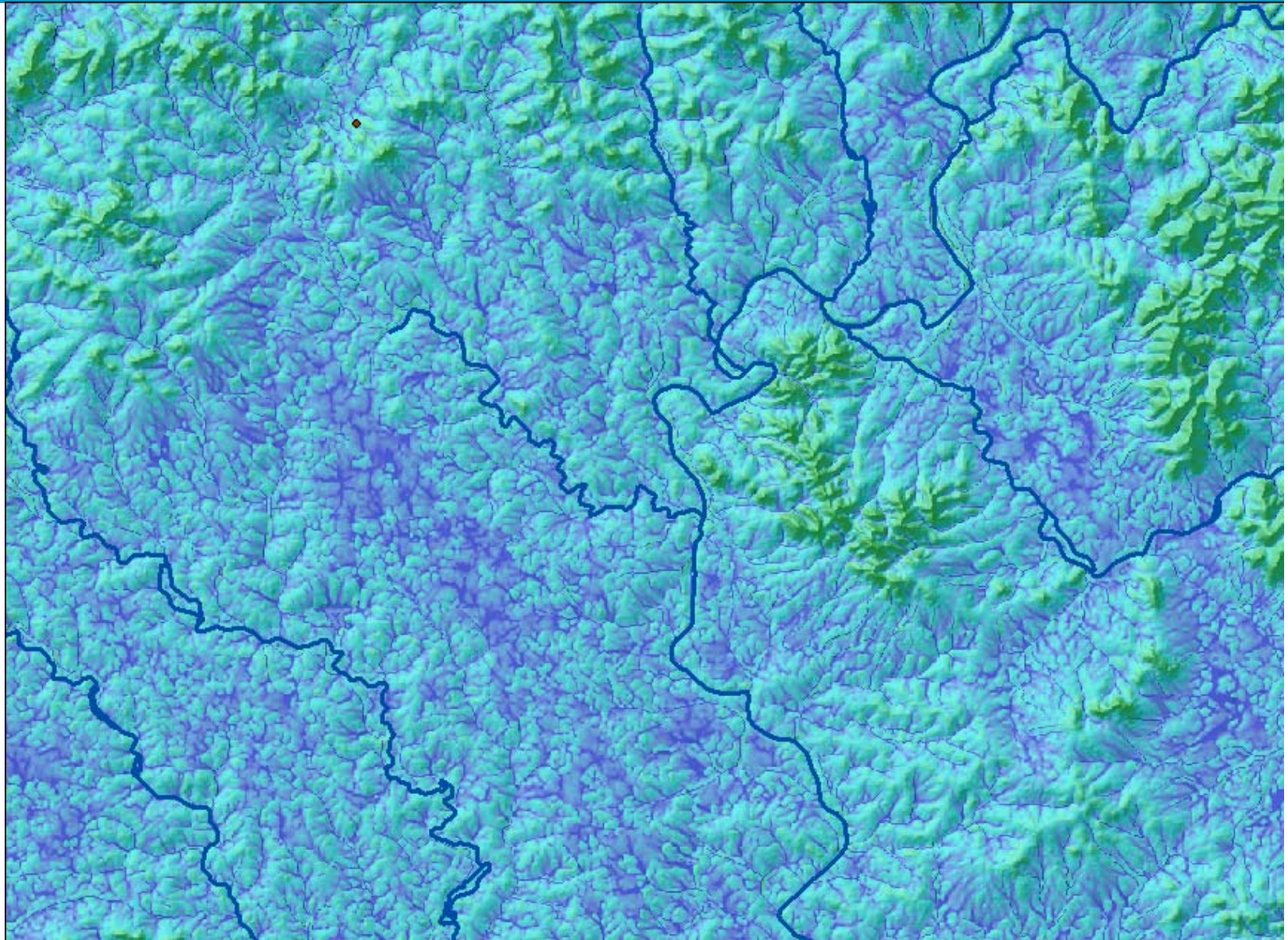
new gamma radiometrics surface in development;

new ‘weathering’ surface available – may be essential for depth of
weathering – an “extra” attribute

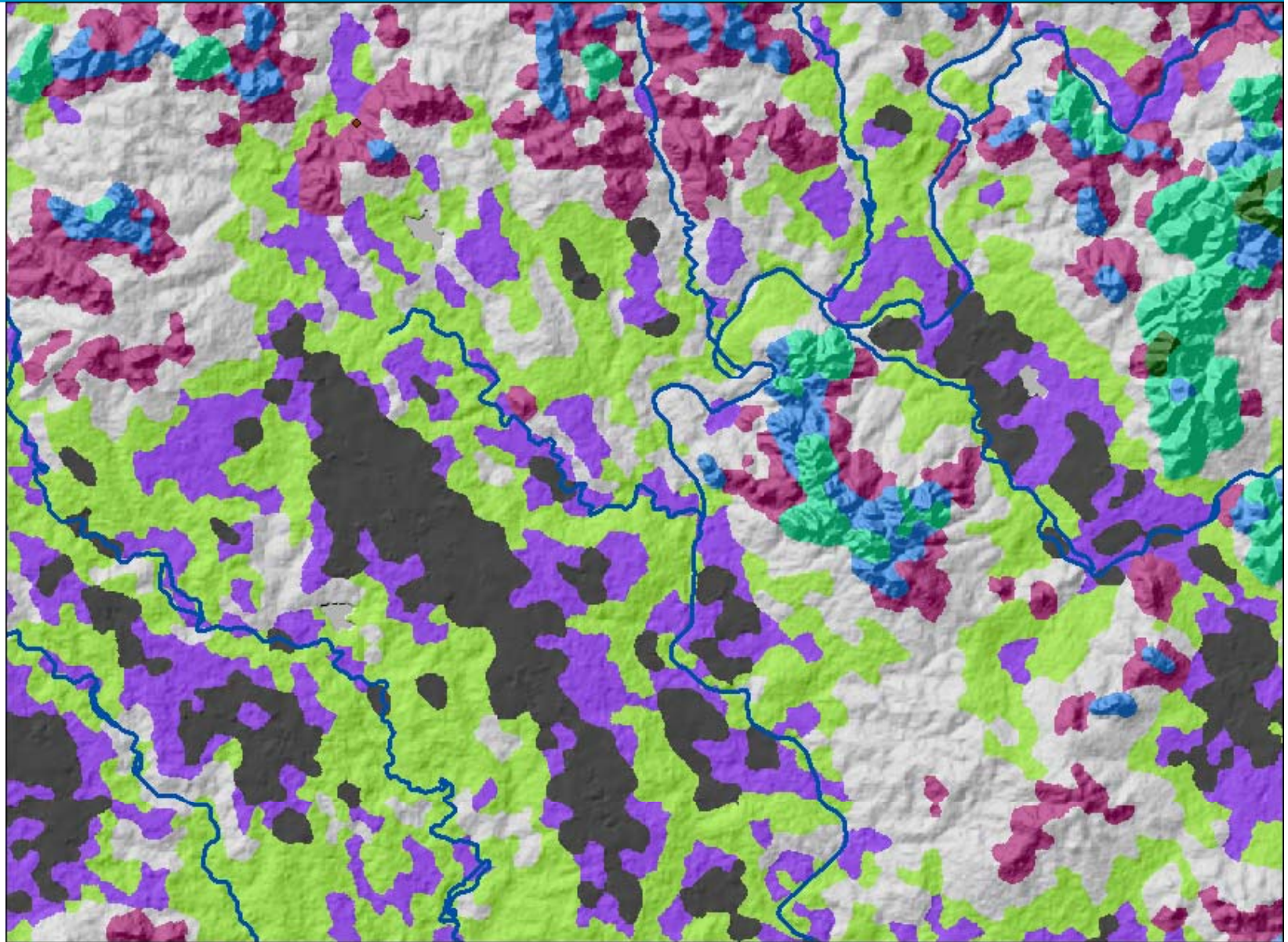
elevation



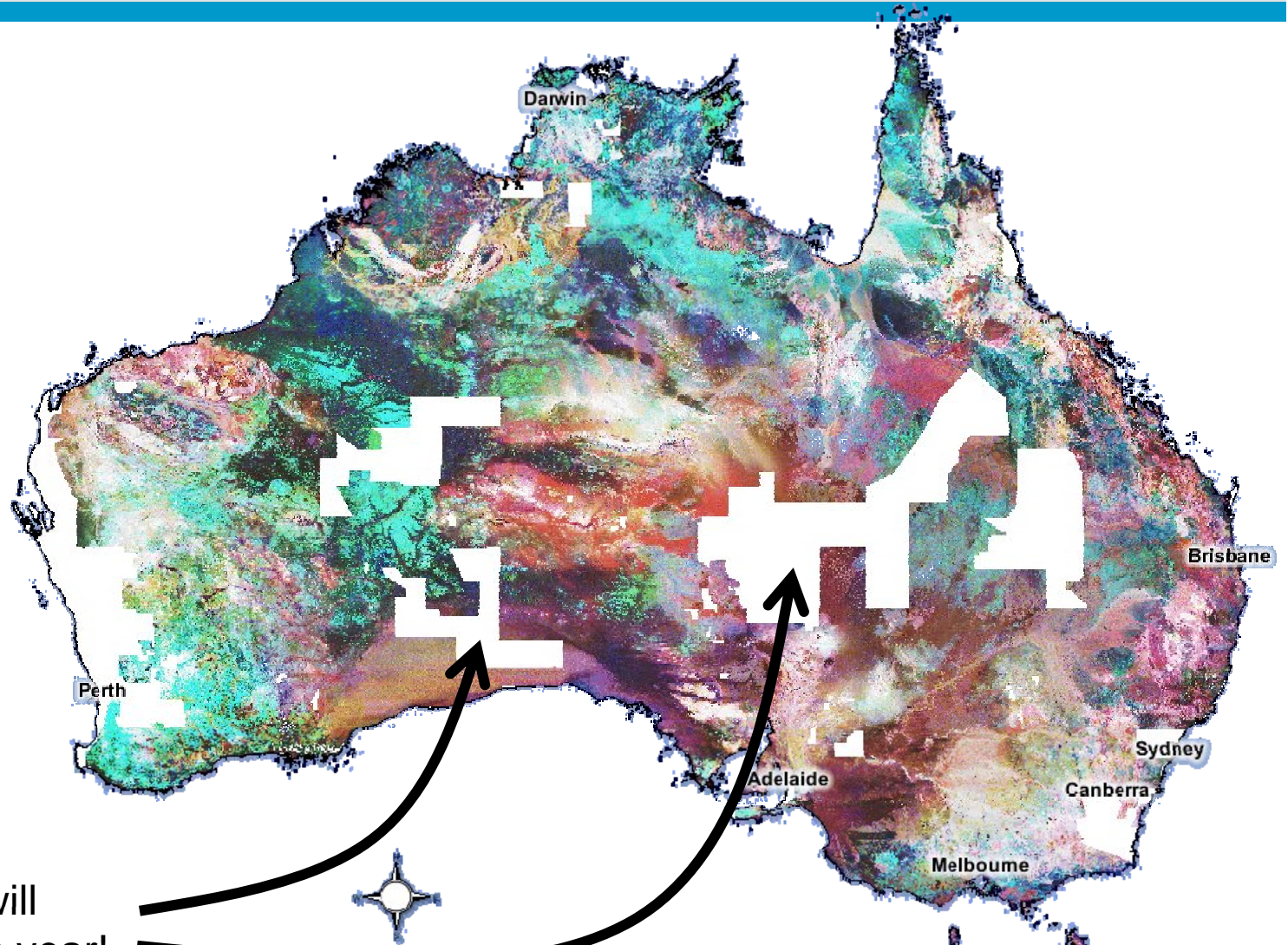
Topographic wetness



Landscape patterns



Gamma radiometrics



White areas will disappear this year!

Data delivered by CSIRO Land and Water

Australian experience in building version 1

The team:

Systems design:

Covariates:

National data collation

Australian Soil Resource Information System (ASRIS) surfaces now in place and available – based on weighted means of the collated polygon data;

accelerating site data collation – with depth spline

MIR scanning of national soil archive in progress – will connect to state agency lab activity (RVR and others)

Inference and pedotransfer

new tools and approach being developed

Communications

initial strategy has been developed and project activity page developed

Estimation activities . . .

Australian experience in building version 1

The team:

Systems design:

Covariates:

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Inference and pedotransfer

Communications

Estimation activities

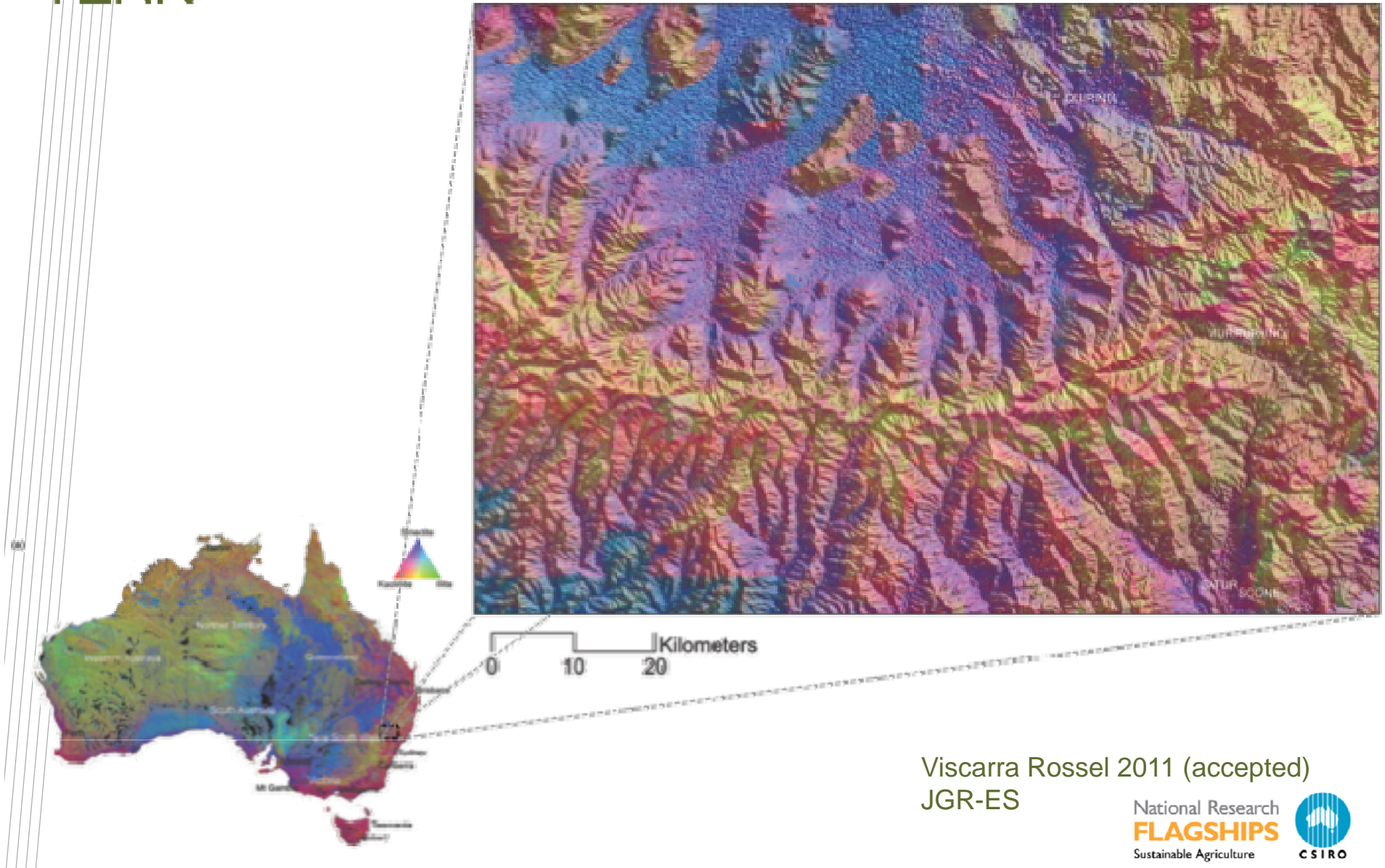
Based around a SCORPAN approach – in a number of phases

Initial phase: National data mining estimation based on early version of covariates and site data scanned with NIR

Immediate focus – new sites, scanning with MIR, investigate alternatives to ‘cubist’; new approaches to uncertainty estimation



Initial surfaces now available



Australian experience in building version 1

The team:

Systems design:

Covariates:

National data collation

Inference and pedotransfer

Communications

Estimation activities

Initial phase:

Second phase:

The second phase

How do we connect the knowledge inherent in 40-50 years of survey (especially the last 20) into the estimation?

- Capture the key knowledge inherent in the polygonal mapping and reports
 - Develop an efficient (situation-dependent?) disaggregation so that it feeds into the national estimation
 - ie. provides more information – decreases noise
 - Test and refine in case studies
 - Develop an approach to evaluate the cost benefit of investment in this in the first version

Current priority

Emerging and interesting facts:

The challenge of monitoring

Inference and pedo-transfer – ensuring that we go beyond the core elements

Especially to match model parameters in their terms

Locally important additions to the specifications

- phosphate retention (PR) pedotransfer function. PR is an important attribute for fertilizer management in NZ
- Total P – highly explanatory variable in Australian native ecosystems
- Depth of weathering – highly explanatory variable in Australian native ecosystems

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Thank you

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