

# FarmMap4D

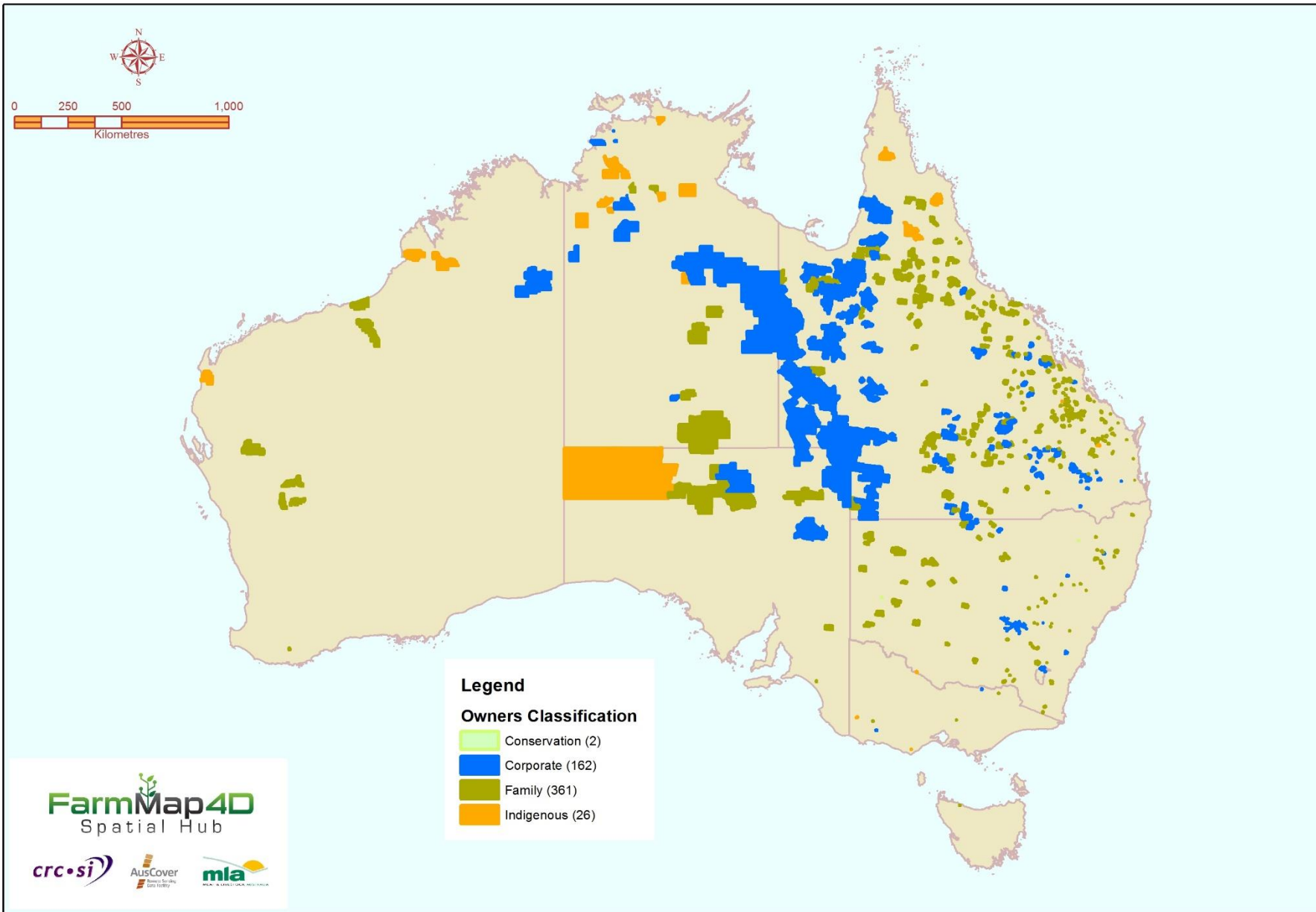
Turning big data into better decisions in the paddock



# An introduction to FarmMap4D

- 20 organisations facilitated by 2 years of NLP funding followed by a year of funding from the CRCSI, MLA, AWI and NRM Groups
- The NRM Spatial Hub was created - an easy to use on-line solution for mapping, assessing and monitoring properties
- Putting 25 yrs of Remote Sensing and GLM science to work using the latest cloud computing and on-line mapping and analysis technologies
- Funding dried up after the 3<sup>rd</sup> year, so it was either close the NRM Spatial Hub or create a commercial entity which keeps the facility available for property owners.
- Currently partially subsidised by MLA.

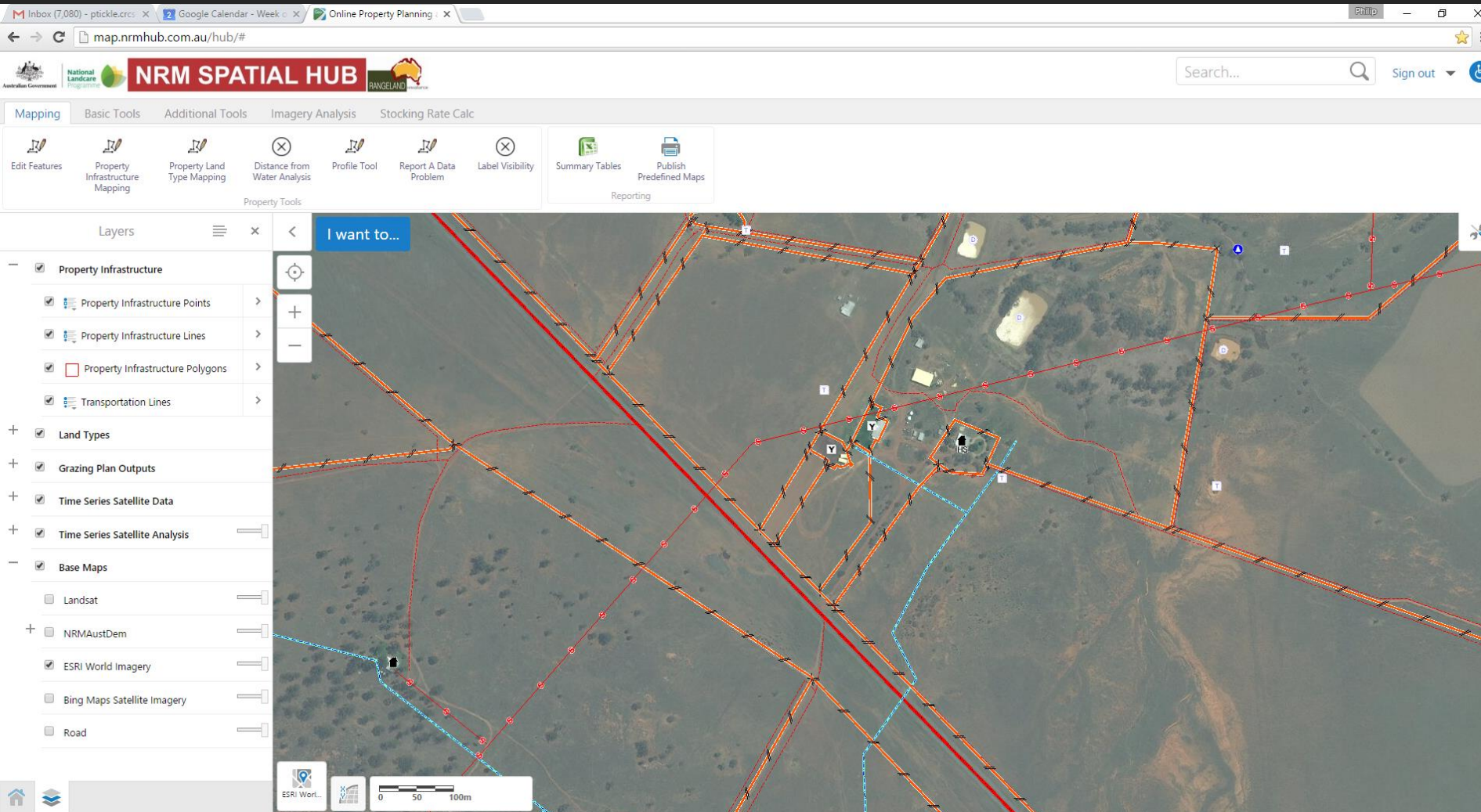




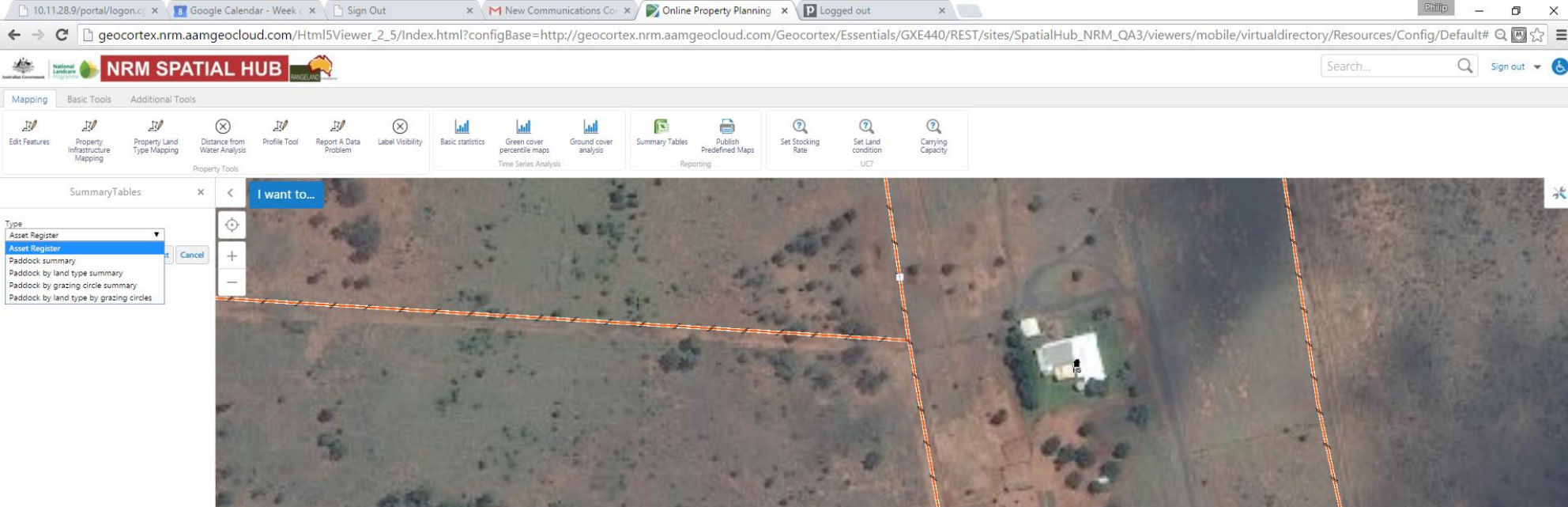
# Current Properties Registered (March 2018)

FarmMap4D Property Registrations

# Infrastructure Mapping



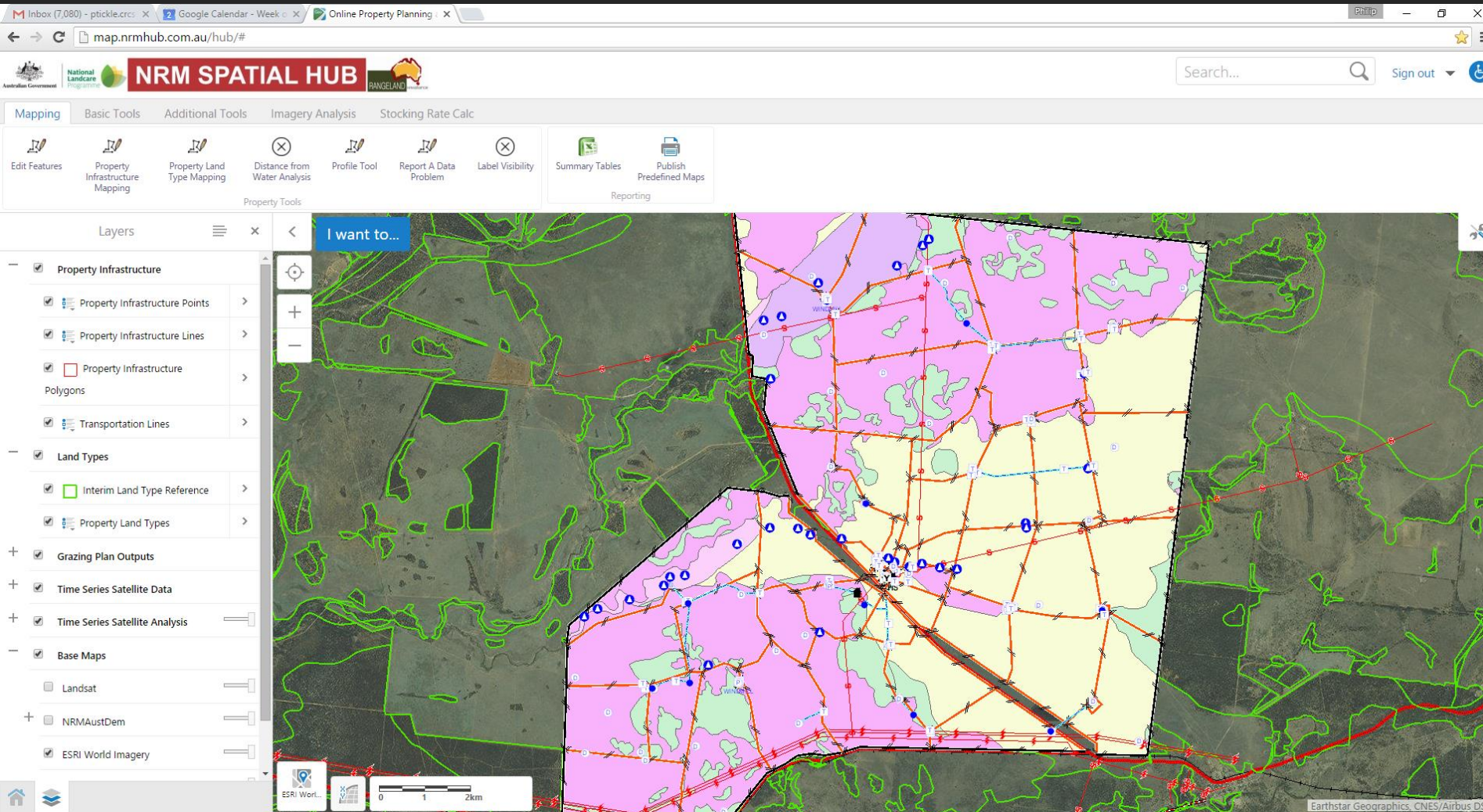
- Access to commercial high res' imagery
  - Massive \$ savings
- Easy to use tools
- Produces nationally standardised data
- Comprehensive database model inc: infrastructure, topographic, transport, cultural et.al features



# Asset Registers and reporting

Category	Type	Name	Built Date	Data Source	Asset Identifier	Capacity(litres)	Capacity(gallons)	Status	Duration of water	Livestock drinking source	Funded by	Comment	Latitude	Longitude	Latitude DMM	Longitude DMM
Livestock	Yards	House Yards	N/A	Satellite imagery	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-24.2965	146.6711	17.789° S 24°	146° 40.264' E
Water	Dam	Currajong Dam	N/A	Satellite imagery	N/A	N/A	N/A	Permanent	Permanent	1	N/A	N/A	-24.3872	146.7742	23.229° S 24°	146° 46.451' E
Water	Dam	Quartpot Dam	N/A	Satellite imagery	N/A	N/A	N/A	Permanent	Permanent	1	N/A	N/A	-24.3863	146.7504	23.179° S 24°	146° 45.023' E
Water	Dam	Duck Creek Dam	N/A	Satellite imagery	N/A	N/A	N/A	Permanent	Permanent	1	N/A	N/A	-24.3648	146.7714	21.890° S 24°	146° 46.286' E
Water	Dam	Middle Dam	N/A	Satellite imagery	N/A	N/A	N/A	Permanent	Permanent	1	N/A	N/A	-24.3596	146.7526	21.578° S 24°	146° 45.155' E
Water	Dam	Napunya Dam	N/A	Satellite imagery	N/A	N/A	N/A	Permanent	Permanent	0	N/A	N/A	-24.3328	146.744	19.967° S 24°	146° 44.638' E
Water	Waterhole	Refuge Hole	N/A	Satellite imagery	N/A	N/A	N/A	Permanent	Permanent	1	N/A	N/A	-24.3084	146.7273	18.506° S 24°	146° 43.640' E
Water	Dam	McDonalds Dam	N/A	Satellite imagery	N/A	N/A	N/A	Permanent	Permanent	1	N/A	N/A	-24.2871	146.7562	17.225° S 24°	146° 45.370' E
Water	Dam	11 Mile Dam	N/A	Satellite imagery	N/A	N/A	N/A	Permanent	Permanent	1	N/A	N/A	-24.2642	146.7437	15.851° S 24°	146° 44.621' E
Water	Dam	Ray's Dam	N/A	Satellite imagery	N/A	N/A	N/A	Permanent	Permanent	1	N/A	N/A	-24.2984	146.7867	17.903° S 24°	146° 47.205' E
Water	Waterhole	Rainmore Hole	N/A	Satellite imagery	N/A	N/A	N/A	Permanent	Permanent	1	N/A	N/A	-24.2901	146.8004	17.407° S 24°	146° 48.026' E
Water	Dam	Gap Dam	N/A	Satellite imagery	N/A	N/A	N/A	Permanent	Permanent	0	N/A	N/A	-24.2506	146.7124	15.037° S 24°	146° 42.742' E
Water	Water trough		N/A	Satellite imagery	N/A	N/A	N/A	Permanent	Permanent	1	N/A	N/A	-24.2472	146.721	14.834° S 24°	146° 43.259' E

# Land Type Mapping



- State integrated land types for each state
- Managers can rename for local use
- Report issues
- Provide the basis for carrying capacity assessment
- New Tool to be released shortly
- Tools for editing linework built but not enabled

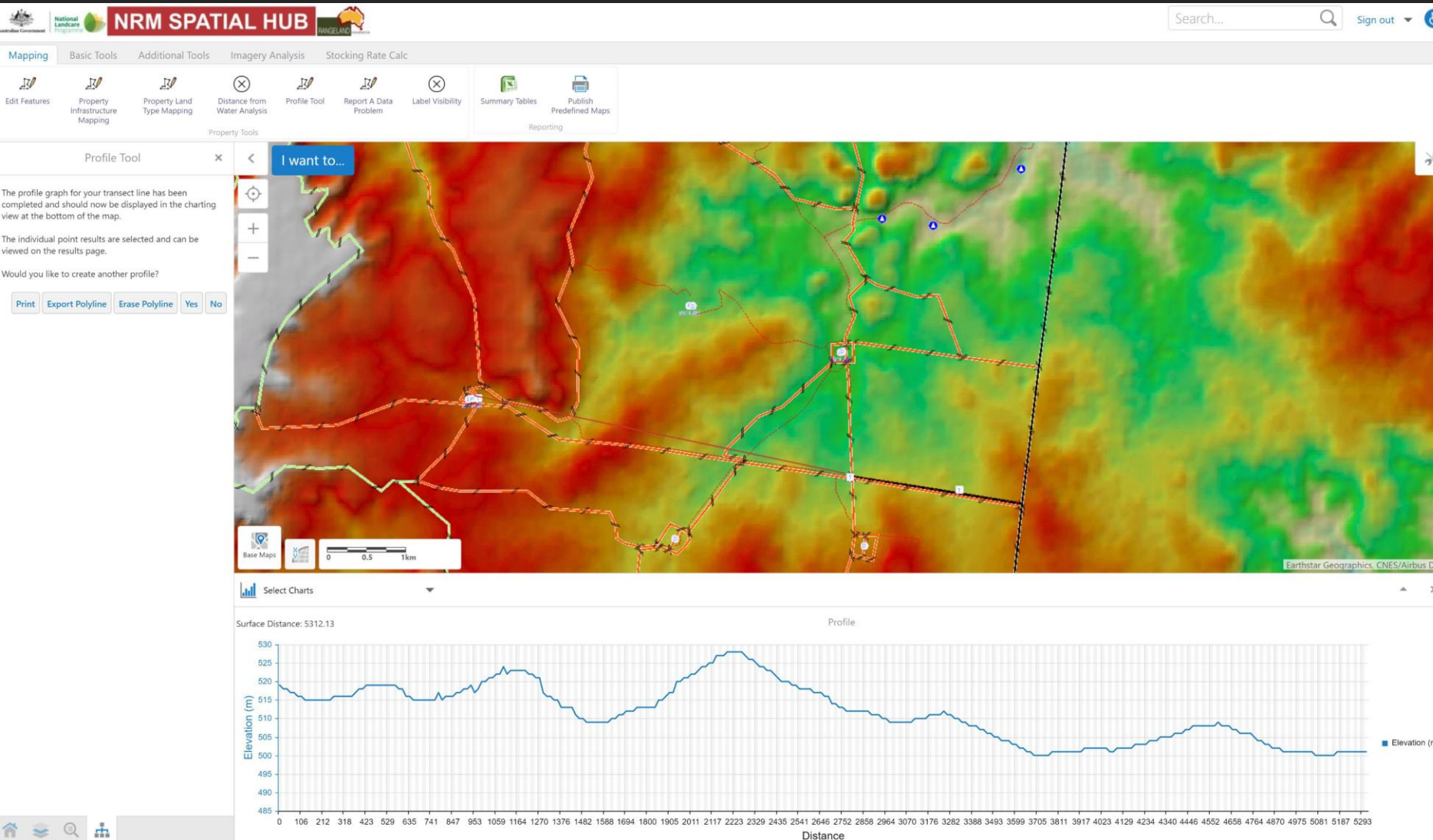
# Distance from Water Analysis

Paddock	Outside	1km	2km	3km	Grand Total
4 C's		237	214	18	470
Banns		141	169	68	377
Banns Sq		6			6
Bartel's		147	210	39	397
Boss's		80	233	109	422
Box Flat		91	178	6	275
Brigalow		77	109	151	336
Brigalow Sq		1			1
Brigalow Sq 2		1			1
Bullfree		137	27		164
Capper		104	211	43	358
Cattle		356	58		414
Cattle Yards	0.2				0
Cheeky Bull		219	156		375
Cottage		48			48
Cultivation		27			27
Dam		13			13
Exhibition		77			77
Finchly		64	10		75
Four Mile		164	280	21	466
Four Mile Sq	0.1				0
Georgie's		84	59		143
Greg's		337	183		519
Horse		66	105	6	177
House	0.4				0
Hunters Flat		12			12
Hut		25	3		29
Island		9			9
Jamison		124	232	203	558
Kirra		171	139	1	310
Knob		130	72		201
Laneway 1	0.6				1
Laneway 2	0.5				0
Laneway 3	0.4				0
Lord's		111	71		182
Lower Jamison		131	317	151	599
Middle		113	107		220
Mountain		136	289	110	535
Munya		160	165	152	476
Munya Sq	1.8				2
Myall		332	2		333
Myall Sq 1			2		2
Myall Sq 2		1			1
New		267	41		308
No 1		54	17		71
Railway		161	91		252
Railway No 2		186	91		277
Ram Shed Yards	0.2				0
Sand Ridge		115	232	33	380
Sand Ridge 3 Mile Sq			6		6
Sand Ridge Sq		3			3
Sheep Yards	0.5				0
Stoney Creek		111	135	19	266
Stud Park HP	1.4				1
Three Mile		280	37		316
Tony's		94	264	223	581
Top Jamison		145	298	96	540
Top Jamison Sq		1			1
Two Mile		158	125		283
West Sandridge		90	143		233
Will's		216	142		358
Windmill		248	181	16	446
Windmill Sq		1			1
Woolshed		87	142	0	230
Grand Total	6.0	6150	5545	1465	13166



- Calculate the net grazing area covered by current water infrastructure
- Run scenarios
- Plan and cost new water

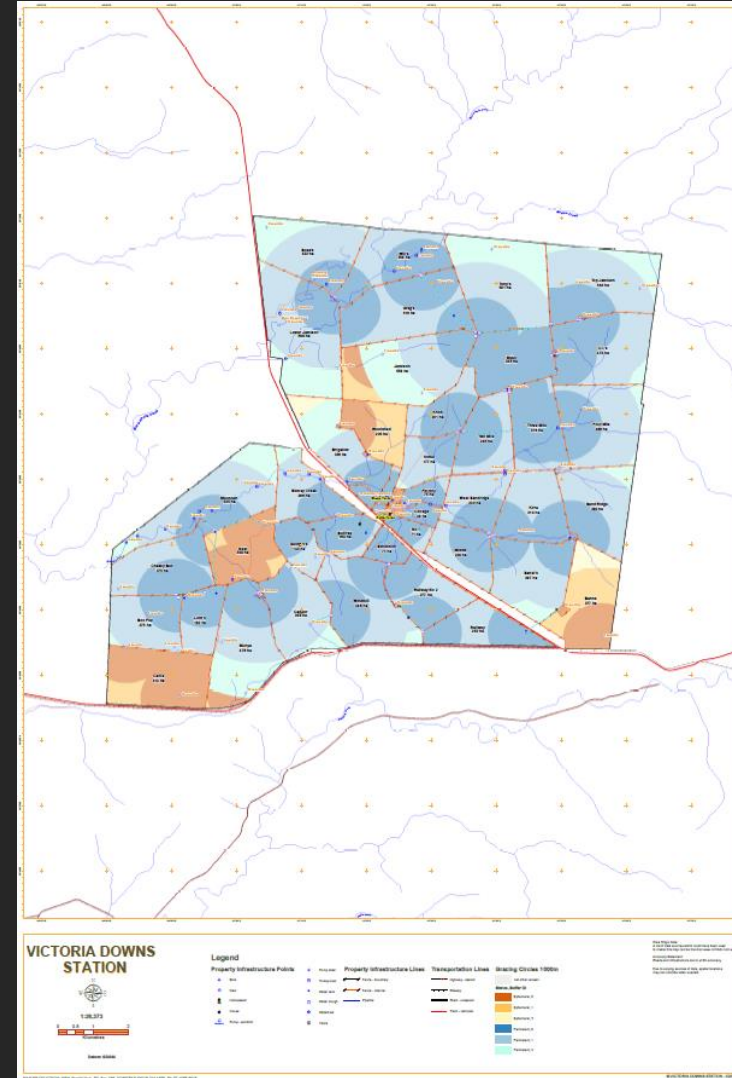
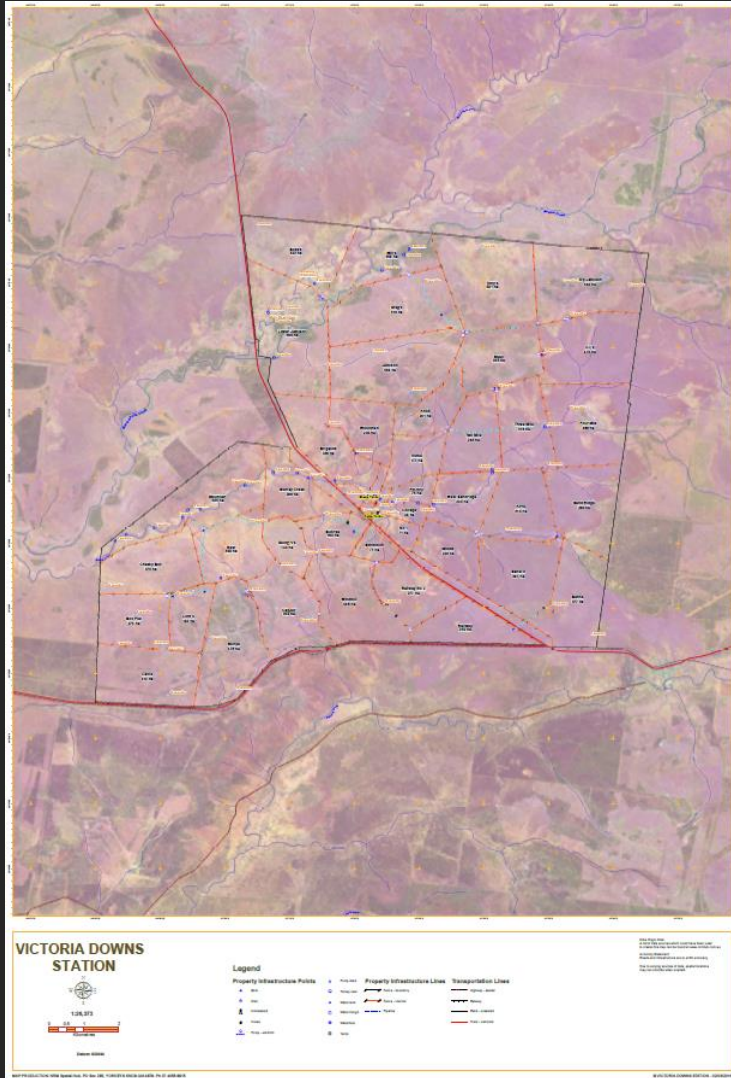
# Infrastructure Planning



- Plan the location of new water
- Use the DEM to estimate rise and fall
- Calculate the length of pipe
- Export to GPS to ground-truth pipelines
- Turns days of work into hours



# Standardised maps and reports



- Cartographic quality map.
- Tabular reports: on assets, paddock and land type areas, distance from water and carrying capacity
- Massive costs and time-savings for extension staff and property managers

Mapping Basic Tools Additional Tools

Edit Features Property Infrastructure Mapping Property Land Type Mapping Distance from Water Analysis Profile Tool Report A Data Problem Label Visibility

Property Tools

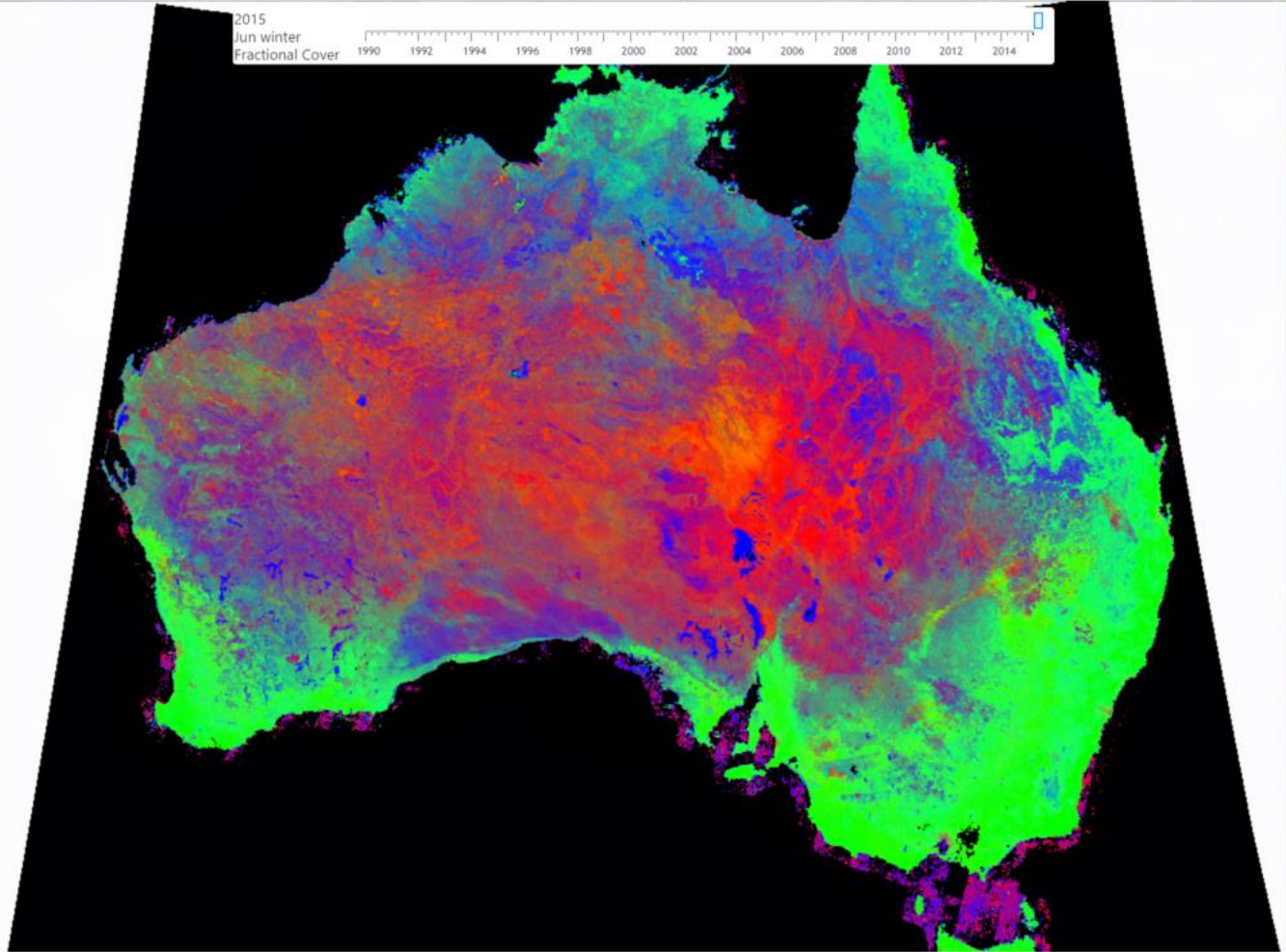
Basic statistics Green cover percentile maps Ground cover analysis Summary Tables Publish Predefined Maps Reporting

Layers

- Property Infrastructure
  - Property Infrastructure Points
  - Property Infrastructure Lines
  - Property Infrastructure Polygons
  - Transportation Lines
- Land Types
- Grazing Plan Outputs
- Time Series Satellite Data
  - Single Dates
- Seasonal Cover
  - Fractional Cover
  - Ground Cover
  - Persistent Green
  - Deciles Total
  - Deciles Green
- Time Series Satellite Analysis
  - Green Cover Percentile Maps

I want to...

ESRI World... 0 200 400km



Earthstar Geographics | NONE

Property Tools

- Edit Features
- Property Infrastructure Mapping
- Property Land Type Mapping
- Distance from Water Analysis
- Profile Tool
- Report A Data Problem
- Label Visibility

- Basic statistics
- Green cover percentile maps
- Ground cover analysis
- Summary Tables
- Publish Predefined Maps

Time Series Analysis Reporting

Layers

- Property Infrastructure
  - Property Infrastructure Points
  - Property Infrastructure Lines
  - Property Infrastructure Polygons
  - Transportation Lines
- Land Types
- Grazing Plan Outputs
- Time Series Satellite Data
  - Single Dates
- Seasonal Cover
  - Fractional Cover
  - Ground Cover
  - Persistent Green
  - Deciles Total
  - Deciles Green
- Time Series Satellite Analysis
  - Green Cover Percentile Maps

I want to...

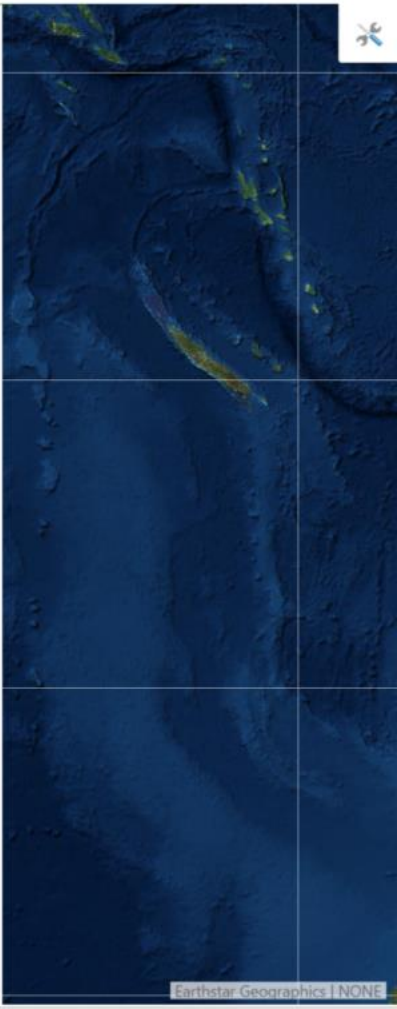
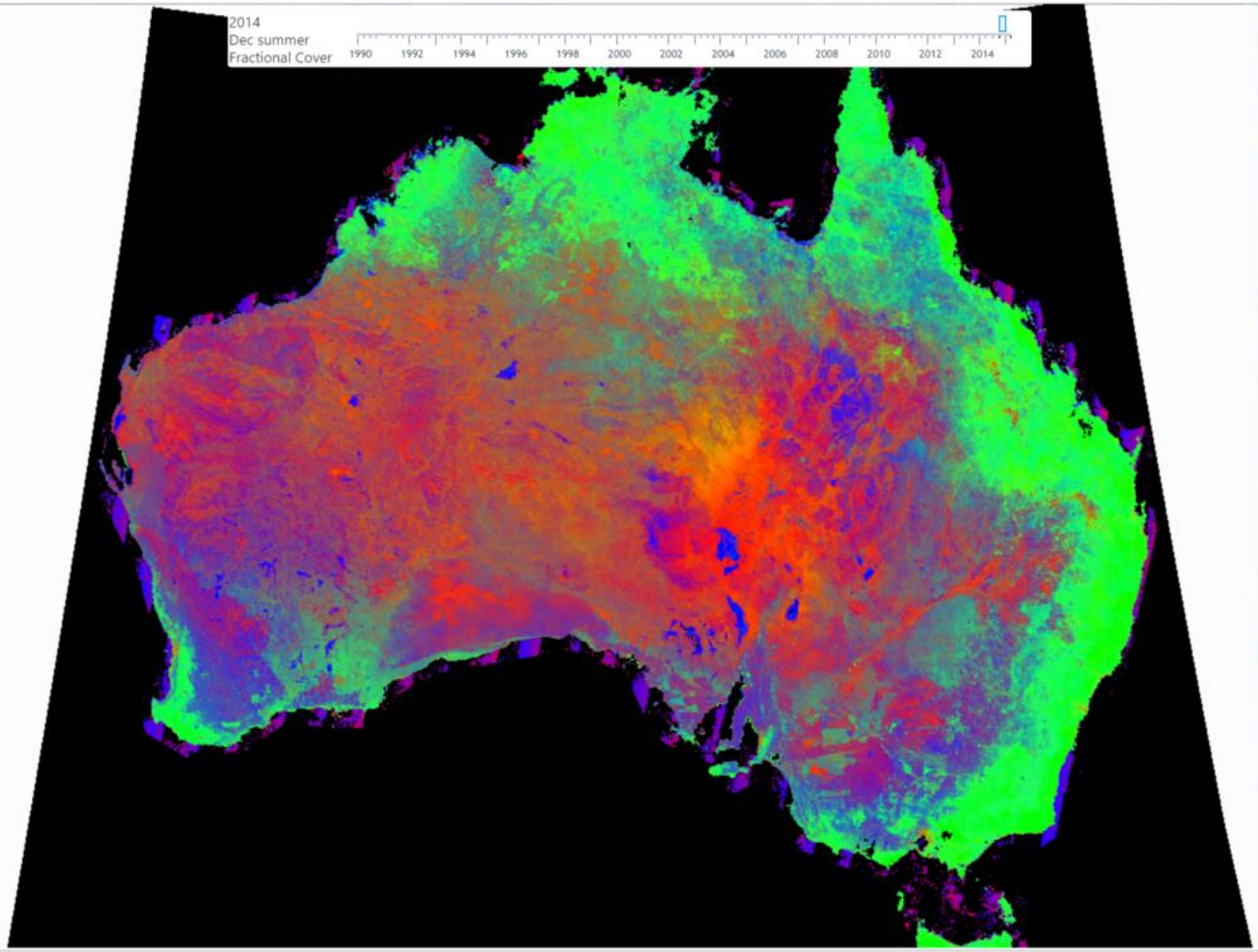
Green Vegetation

Non-green Vegetation

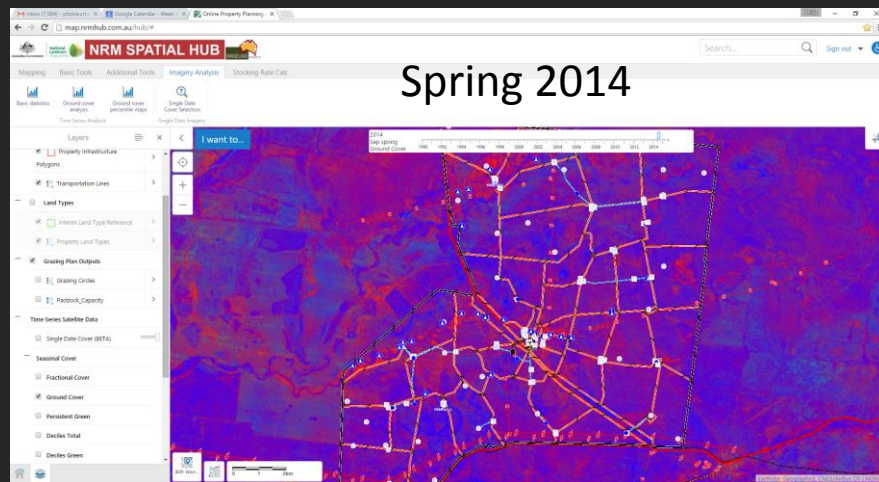
Bare Ground

ESRI Wor...

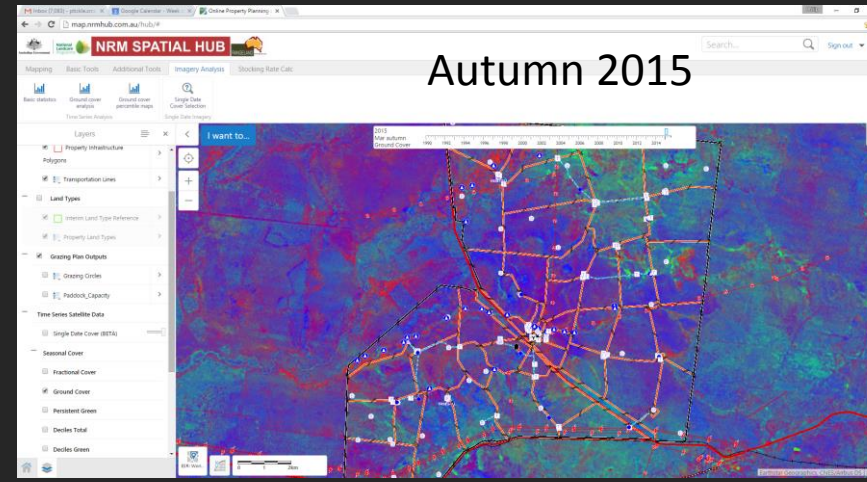
0 200 400km



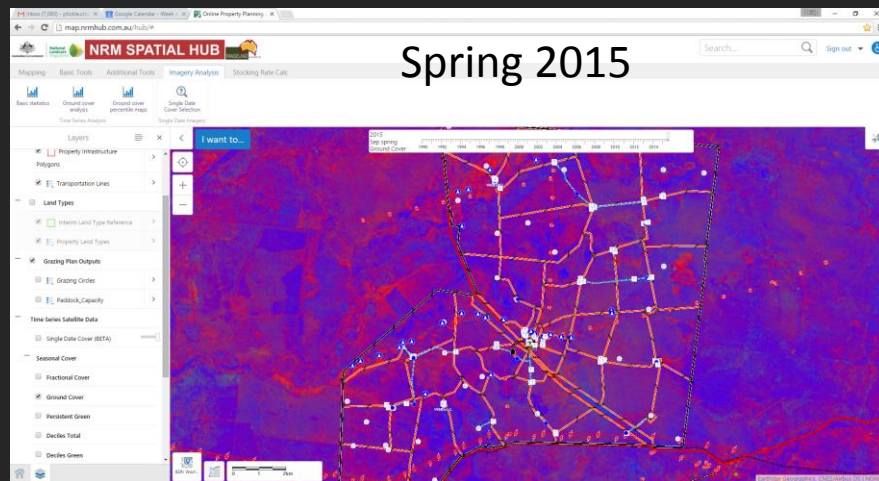
# Ground Cover – Seasonal Status



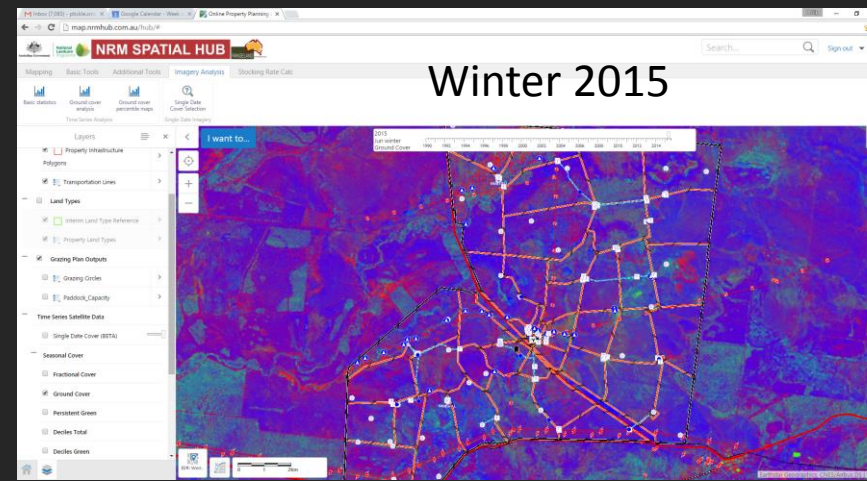
Spring 2014



Autumn 2015



Spring 2015

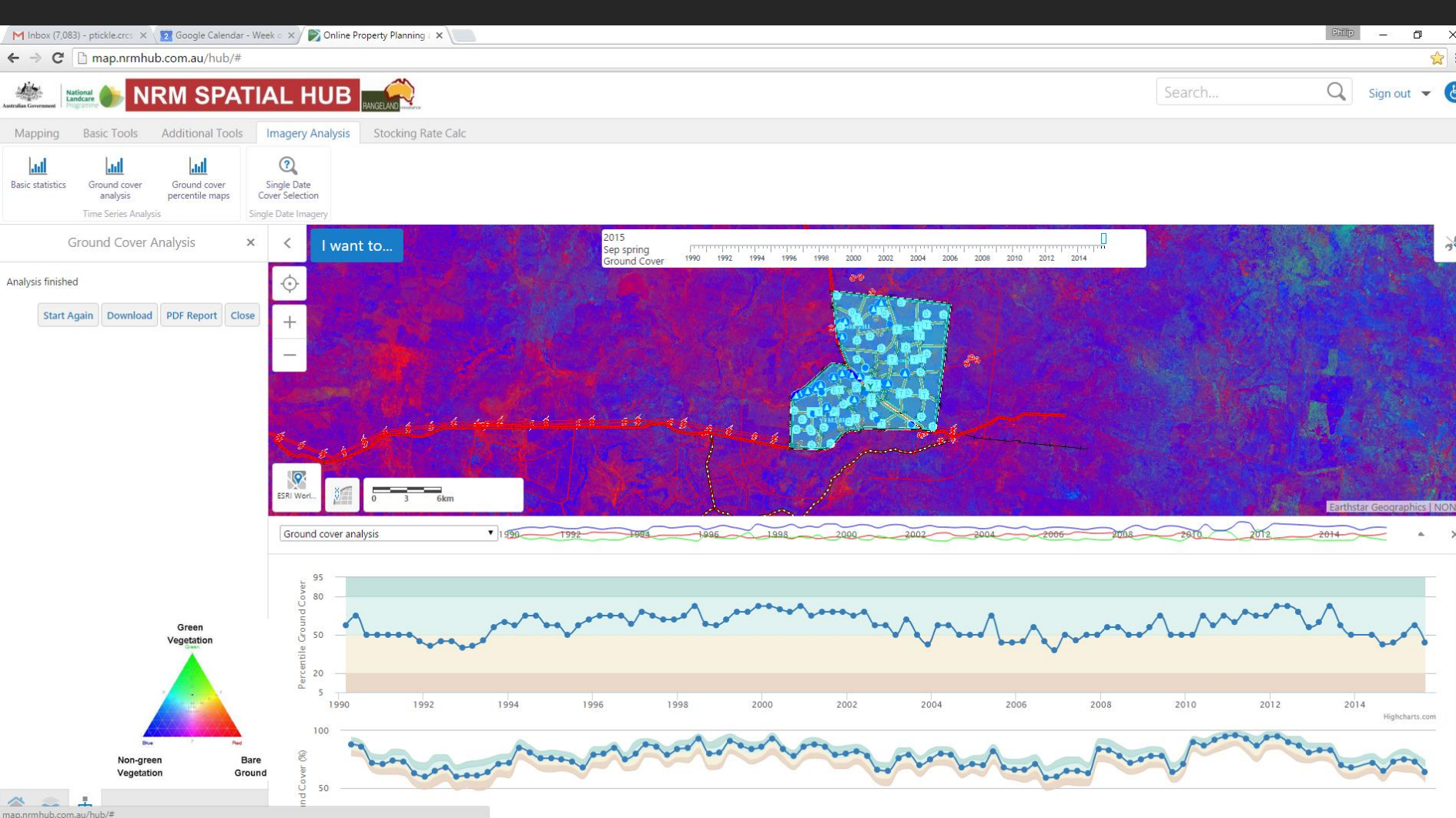


Winter 2015

- National coverage every 16 days @ 25m resolution since 1987
- The “general punter” could never access the data.
- Land manager can report on changes in fractional cover or fractional ground cover for the last ~30 yrs
- Report on any spatial unit: property, paddock, land types, user defined
- Export to a table
- Takes ~10 secs on a flakey mobile phone connection

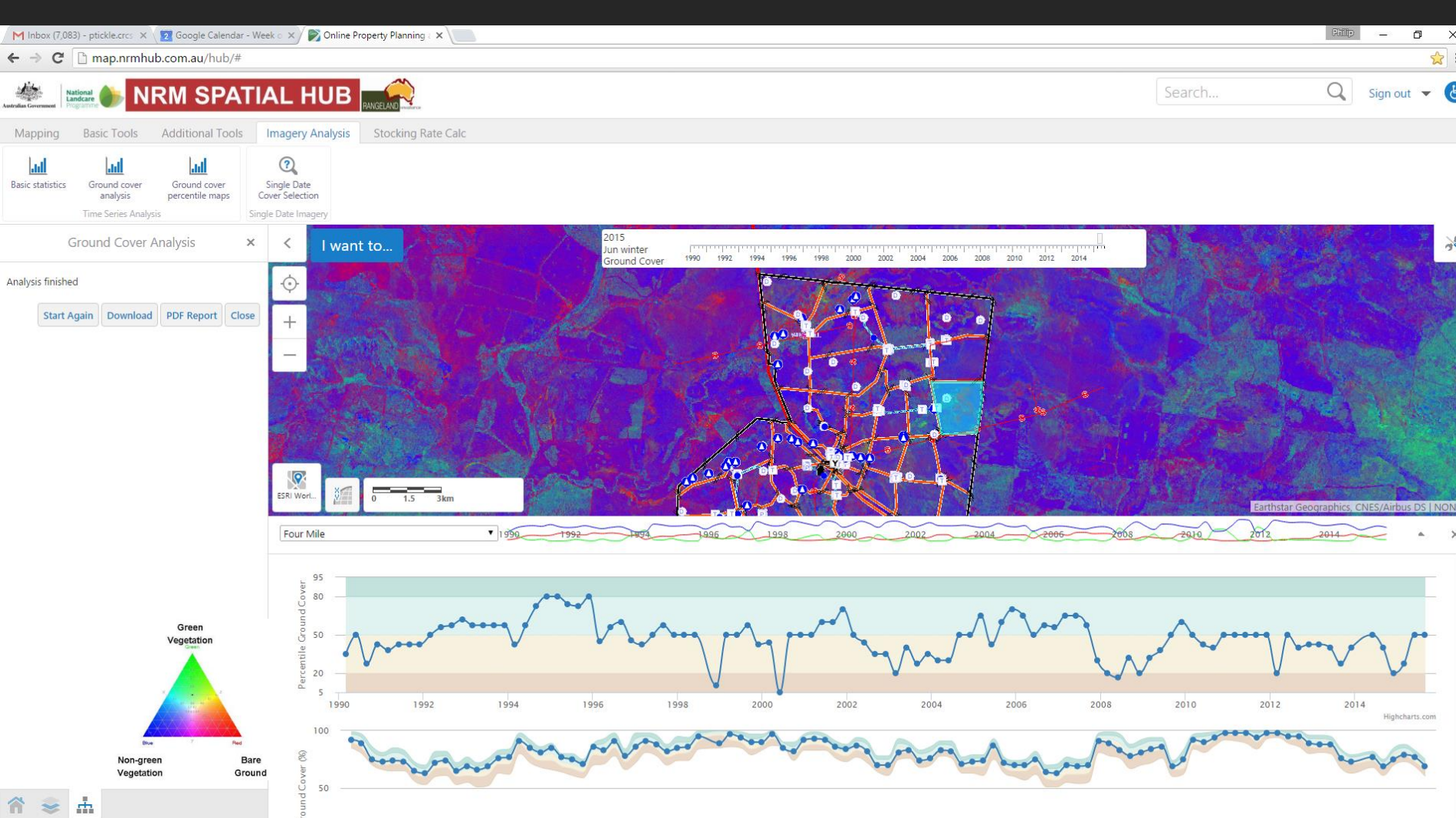


# Property Benchmarking



- Benchmark changes in cover
- Export to a table
- PDF Report

# Paddock Benchmarking

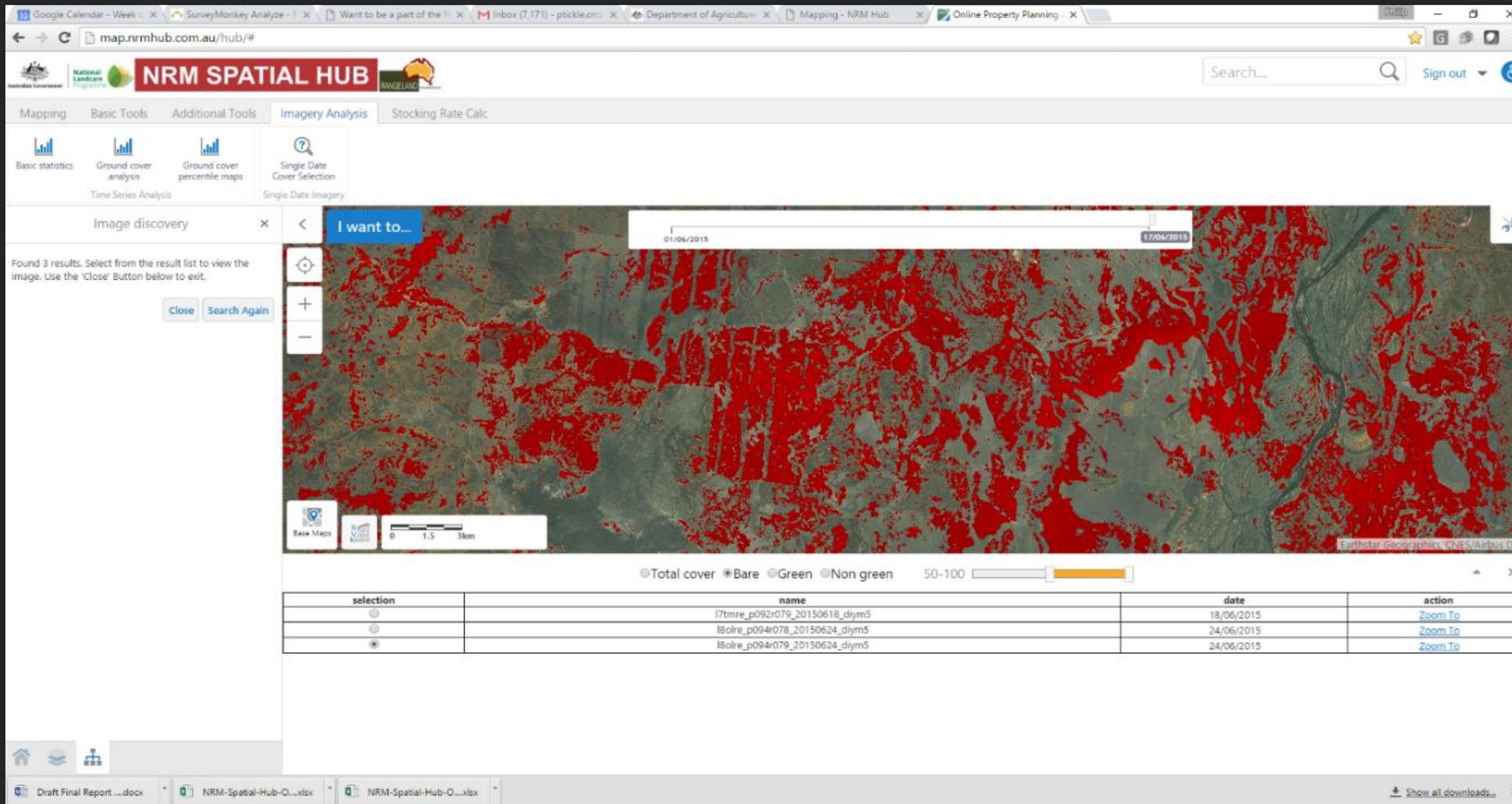


- This graph shows how the highlighted paddock (the line) compares to the paddock above over time.

# Monthly Ground Cover Reporting

An area near Morven, Qld in June 2015. The red areas have more than 50% bare ground

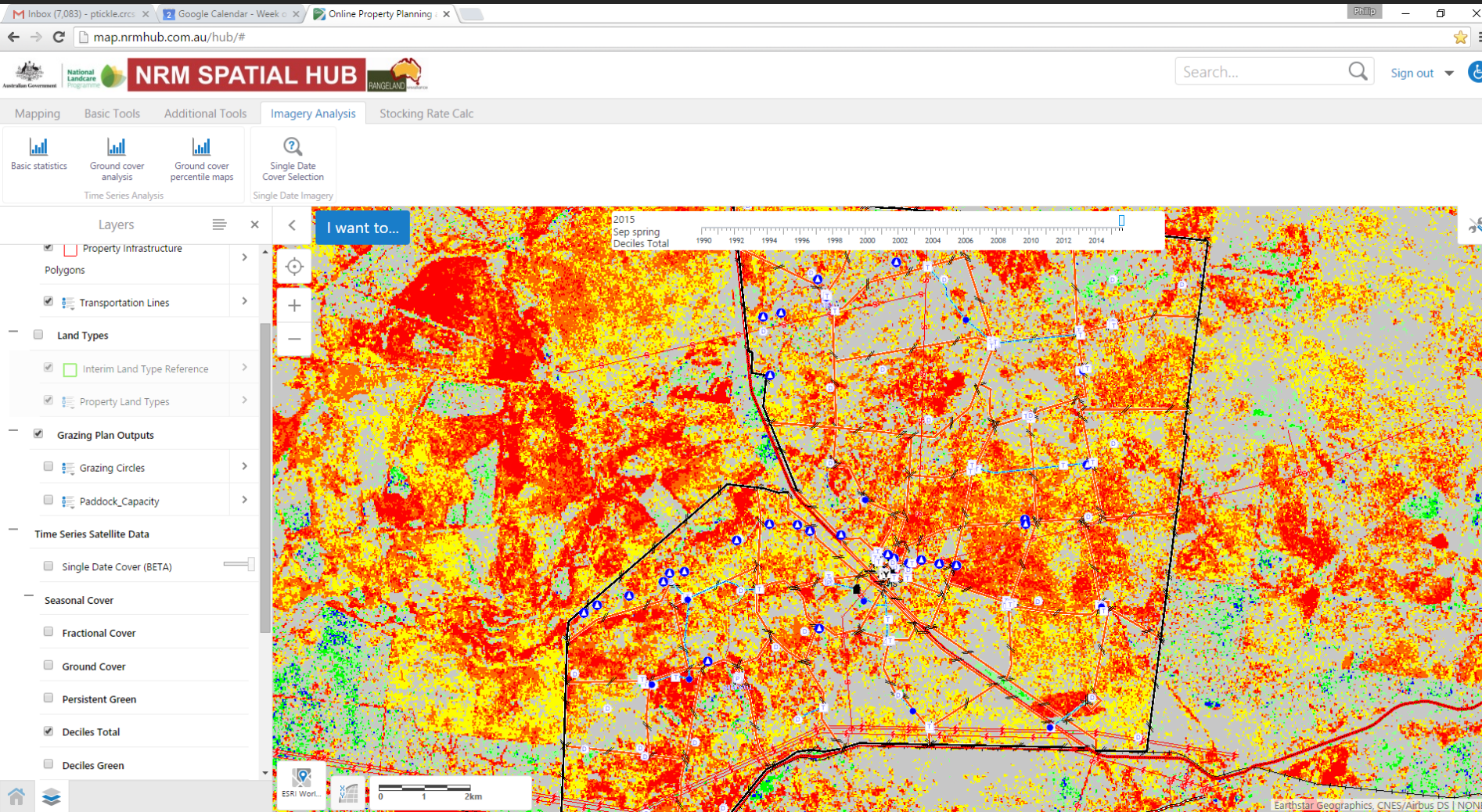
Processing EVERY new Landsat Scene every 16 days.



The screenshot shows the NRM Spatial Hub interface. The main map displays a satellite image with red areas indicating bare ground. A search bar at the top right contains the text "I want to...". Below the map, there is a table with the following data:

selection	name	date	action
<input type="radio"/>	l7tmre_p092r079_20150618_d1ym5	18/06/2015	<a href="#">Zoom To</a>
<input type="radio"/>	l8olre_p094r078_20150624_d1ym5	24/06/2015	<a href="#">Zoom To</a>
<input checked="" type="radio"/>	l8olre_p094r079_20150624_d1ym5	24/06/2015	<a href="#">Zoom To</a>

# Drought and Condition Assessment

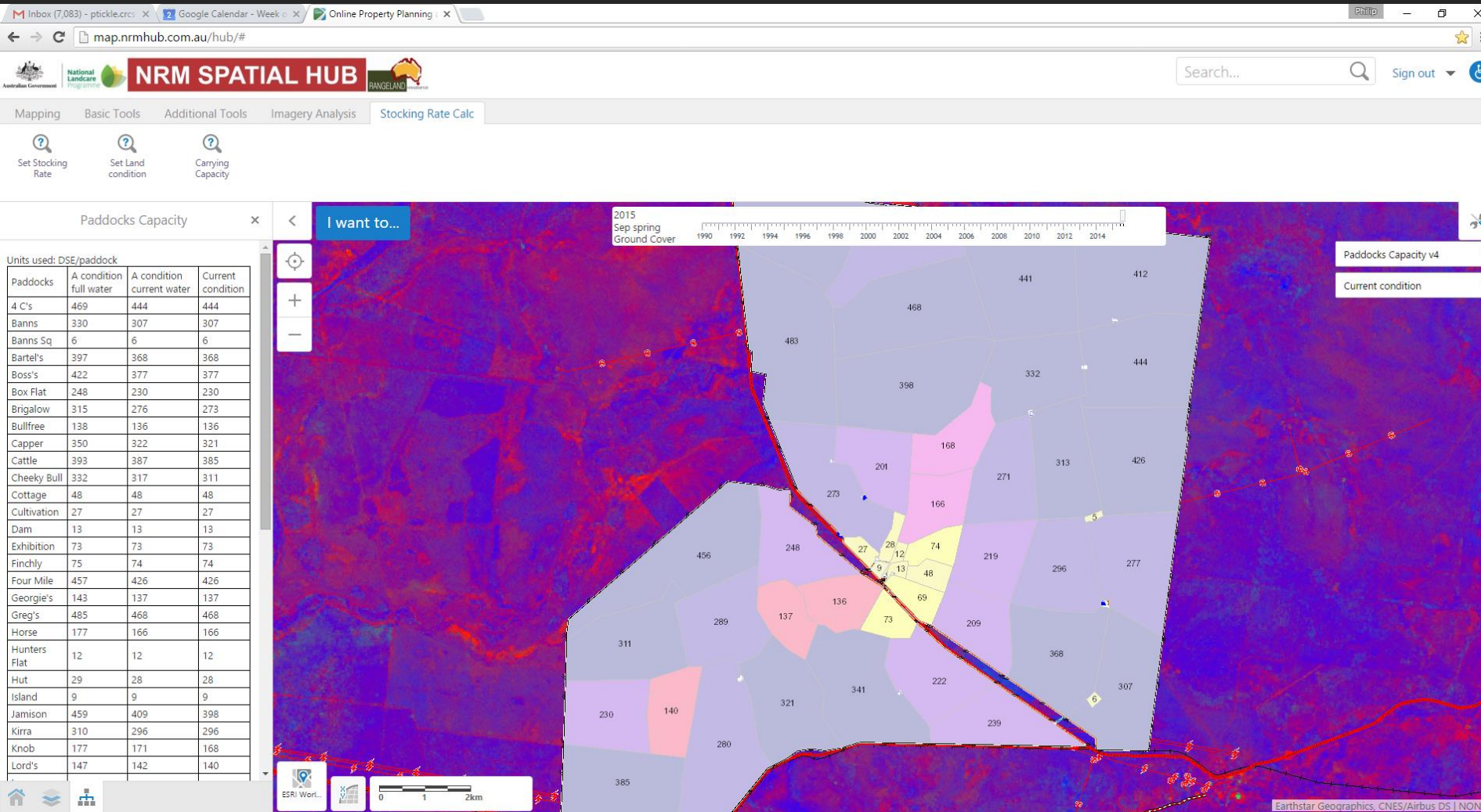


- Ranking of total ground cover for the current season relative to the same season back to 1987
- This example is the 2015 Spring compared to all Springs back to 1987
- Red-orange is the lowest 10%



# Safe Carrying Capacity Tool

- Brings the GLM elements together
- Land type CC
- Watered area
- GLM Land Condition score for each paddock
- Calculates Paddock CC based on
  - Current condition,
  - Current water
  - Potential in A condition
  - Potential fully watered



# Recent User Surveys – The Benefits

- 90% - Hub easy to use.
- 95% - potential to measurably improve the productivity, profitability and sustainability
- 50+% - save 10 - 30 labour days a year.
- 75% - measurably increase safe carrying capacity through better pasture utilisation.
- 72% - technology important to business viable and sustainability in the future.
- 50+% of properties 50% developed

# Priority Application Development

(feedback from landholders)

- **Pasture biomass and budgeting**
- **Integration with paddock record keeping systems**
- **Temporal Land Use mapping**
- **Land Condition Assessment inc. more advanced methods, monitoring sites and photo points**
- **Improved land typing**
- **Drought Assessment**
- **Multiple Scenario Property planning and Capex module**
- **Carbon and ecosystem services**
- **Land valuation**
- **Biosecurity including pest and weed management**
- **Fire planning (North Aust)**

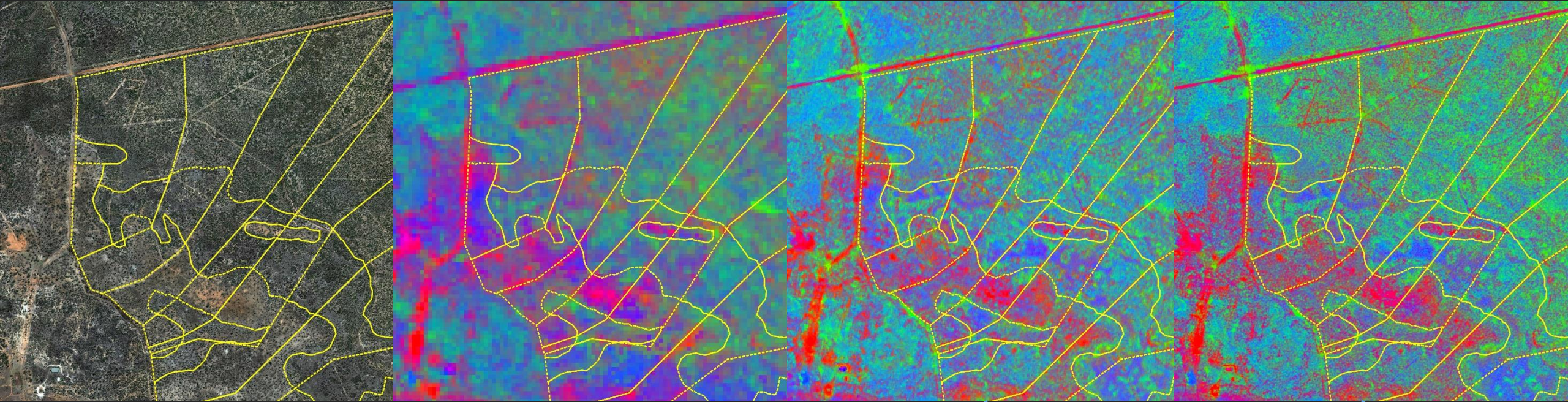
# The Future – Monthly, Weekly and ultimately daily paddock scale imagery

30-50cm imagery annually

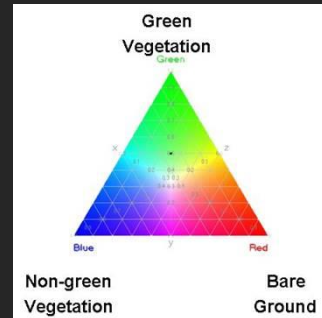
25m Fractional Cover – 16 days

10m Fractional Cover – 5 days

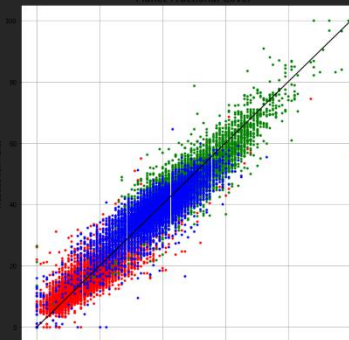
4m Fractional Cover – daily



NDVI is limited to estimating “green biomass”



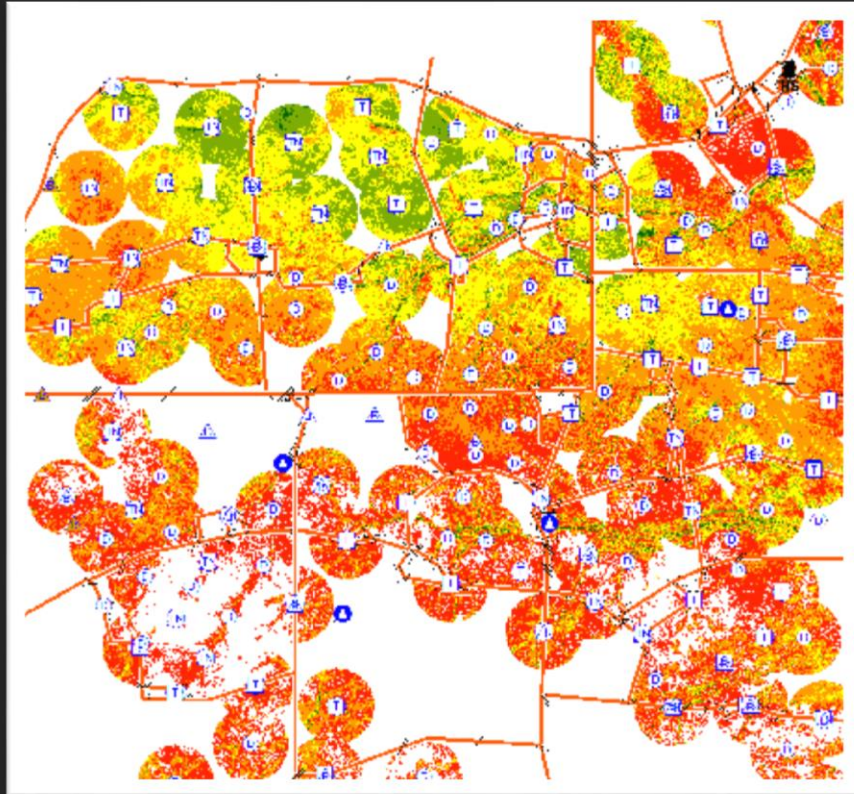
Fractional Cover provides an opportunity to estimate “total biomass” outside growing seasons and where non-green dominates sword.



Composite weekly fractional cover help to get through the cloud

# The Future Northern Pastures example

- End of Wet stocking rates
- 2<sup>nd</sup> Round movements
- Pasture response to local rain events
- Land condition assessments



Fractional  
Cover



Net  
Grazable  
Area

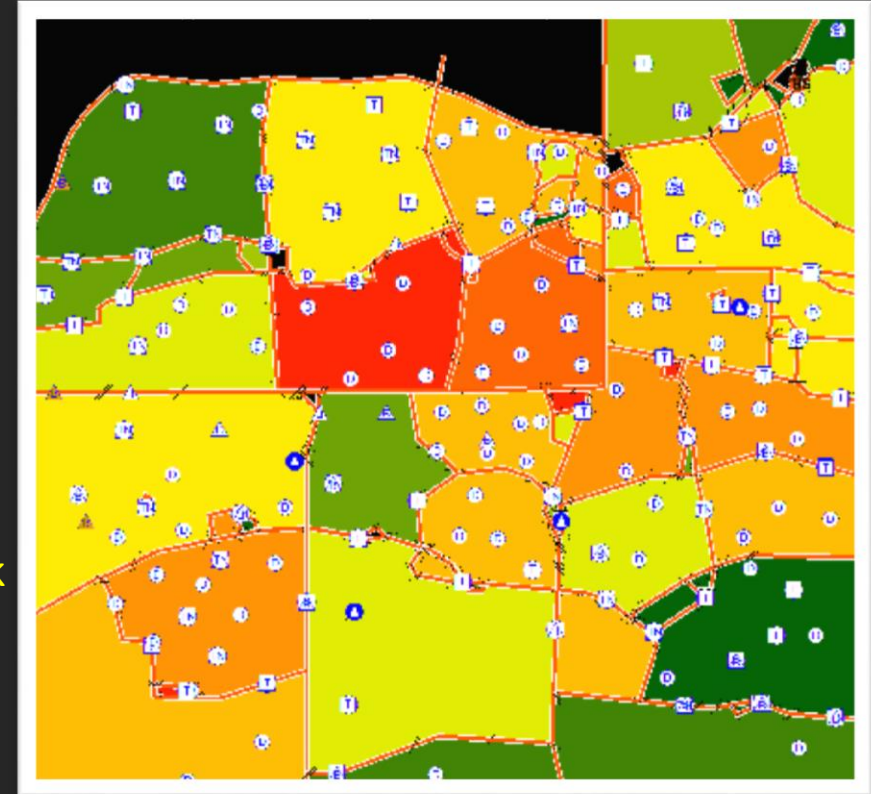


Class 1 Yield	0
Class 2 Yield	200
Class 3 Yield	300
Class 4 Yield	400
Class 5 Yield	500
Class 6 Yield	600
Class 7 Yield	700
Class 8 Yield	800
Class 9 Yield	900
Class 10 Yield	1000

Paddock  
kg DM



Paddock  
Ranking



100km

# Questions

[www.farmmap4d.com.au](http://www.farmmap4d.com.au)

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Fractional Ground Cover imagery is provided by AusCover – Remote Sensing Data Facility

