Geospatial in the Start-up Age

Introducing Astron, emapper & C4D Intel

Stu Paisley

May 2019

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Astron Environmental Services

Stu Paisley - Senior Remote Sensing/GIS Analyst

Specialising in:

- Survey Design
- Photogrammetry & Lidar Processing
- Geodesy, GNSS/Inertial Survey & Processing
- RPAS maintenance controller
- 25 Years in Geospatial Industry
- Bachelor Surveying
- PostGradDip Exploration Geophysics

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Astron Environmental Services

- Independently owned environmental consultancy
- Based in East Perth, Western Australia
- 70+ Staff: Environmental Science, Botany, Zoology, GIS, Remote Sensing, Data Science, Surveyor
- Clients: Mining, Oil and Gas, Utilities, State and Local Govt.
- Related start-up companies: C4D Intel and emapper

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Astron Geospatial Team

10 staff members – Highly experienced in remote sensing and geospatial data analysis

- Managed by Dr Jasmine Muir
- Support activities of emapper & C4D Intel
- Remote Sensing: Satellite, Manned Aircraft & Drone
- Photogrammetry and Lidar
- Machine Learning & Computer Vision
- Time series data analysis
- 3D modelling
- Erosion and plume monitoring
- Minesite Rehabilitation Performance Monitoring

Start-up Companies

Astron began pivoting towards using remote sensing prior to the resource sector downturn in 2013.

The capital investment in drones and related hardware and software is high. Slow take-up by our clients resulted in us looking beyond our traditional market sector and into surveying, forestry & industrial inspection. This resulted in the creation of the first start-up **C4D Intel**.

The adoption of remote sensing was slow amongst our clients, primarily due to the difficulty in conveying remote sensing derived outcomes using traditional reporting means.

This resulted in the creation of our second start-up **emapper**.

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C4D Intel - Introduction

C4D Intel specialises in surveying, inspection and modelling of assets using high resolution imagery, photogrammetry and laser scanning.

We utilise a range of tools from advanced remote aircraft, robotic crawlers, telescopic cameras and tethered systems to get the data our clients need.

C4D Intel's objective is to make inspection surveys **smart**, **fast**, **economical** and **safe**.

C4D INTEL

C4D Intel – Fixed Wing Surveying Drones

Fixed Wing Aircraft

C-Astral Bramor rTK – Catapult Launch, Parachute Retrieval. Sony a6000 camera

SRP Lynx-M PPK – Hand Launch, Deep Stall Landing. Sony a6000 camera, Emlid Reach M+ PPK GNSS

C4D Intel – Multirotor Surveying & Inspection Drones

Multi Rotor Aircraft

- Modified DJI Phantom 4 Pro – RGNir Camera, Emlid Reach M+ GNSS
- DJI Inspire 2 – RGN & RGNir Zenmuse X4S Cameras, Airgon Loki GNSS
- DJI Matrice 210 – Zenmuse Z30 Zoom Camera
- DJI Matrice 600 PRO – Sony Alpha 7rii Camera, Emlid Reach M+ GNSS
- Flyability Elios – Confided Space Inspections

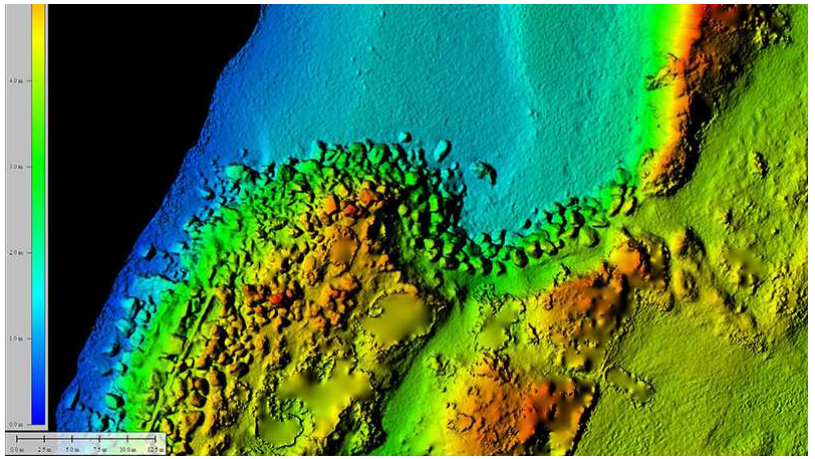
C4D INTEL

C4D Intel – Reality Modelling & Confined Space Inspection

C4D INTEL

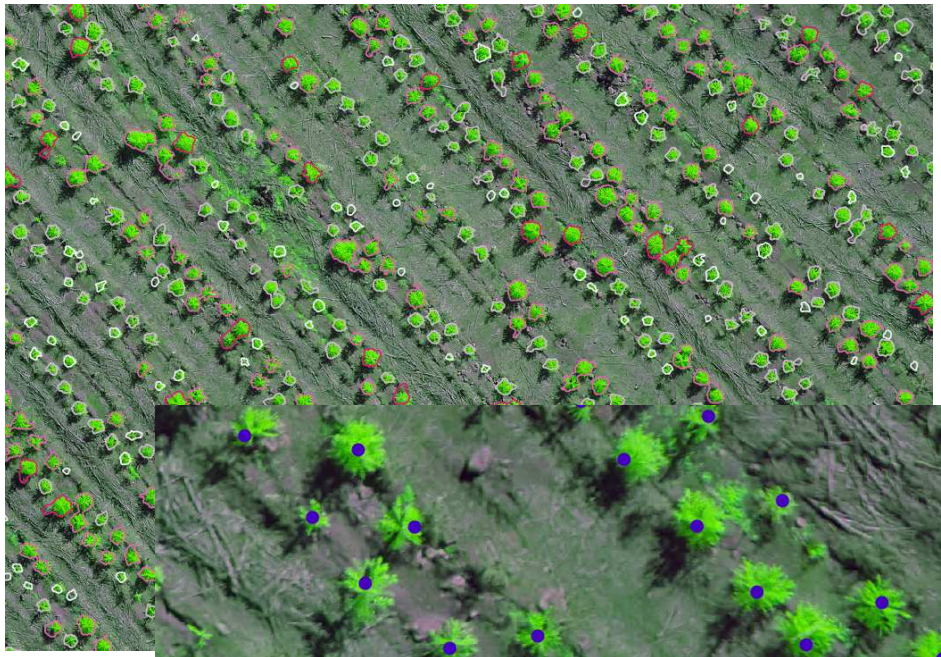
https://sketchfab.com/C4DIntel

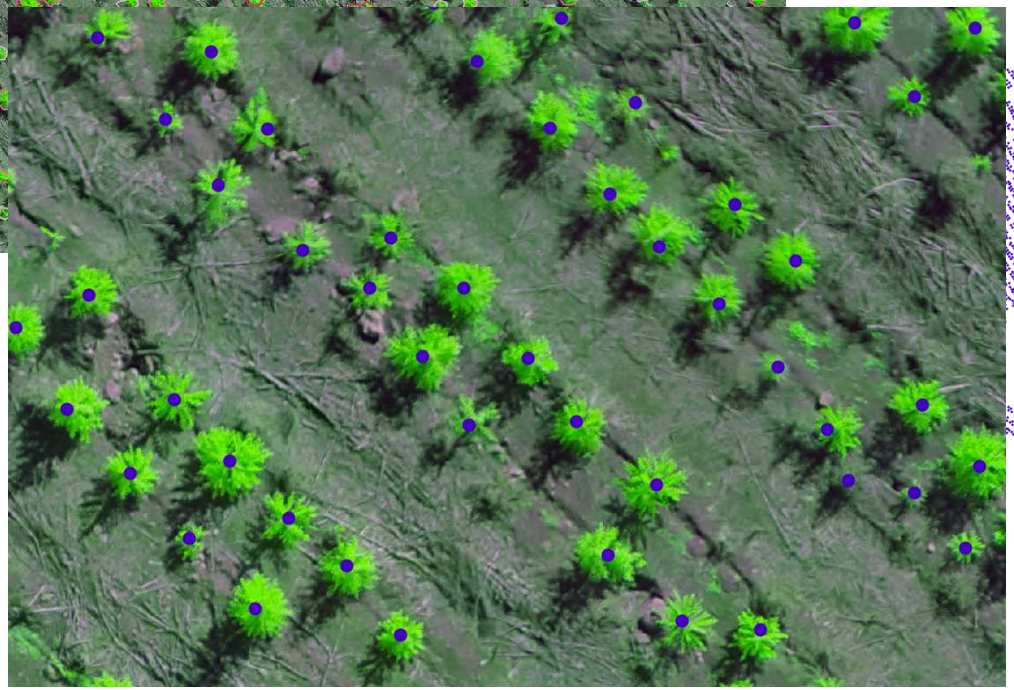
C4D Intel – Coastal & Volumetric Surveying



C4D INTEL

C4D Intel – Forestry Seedling Survival Surveys



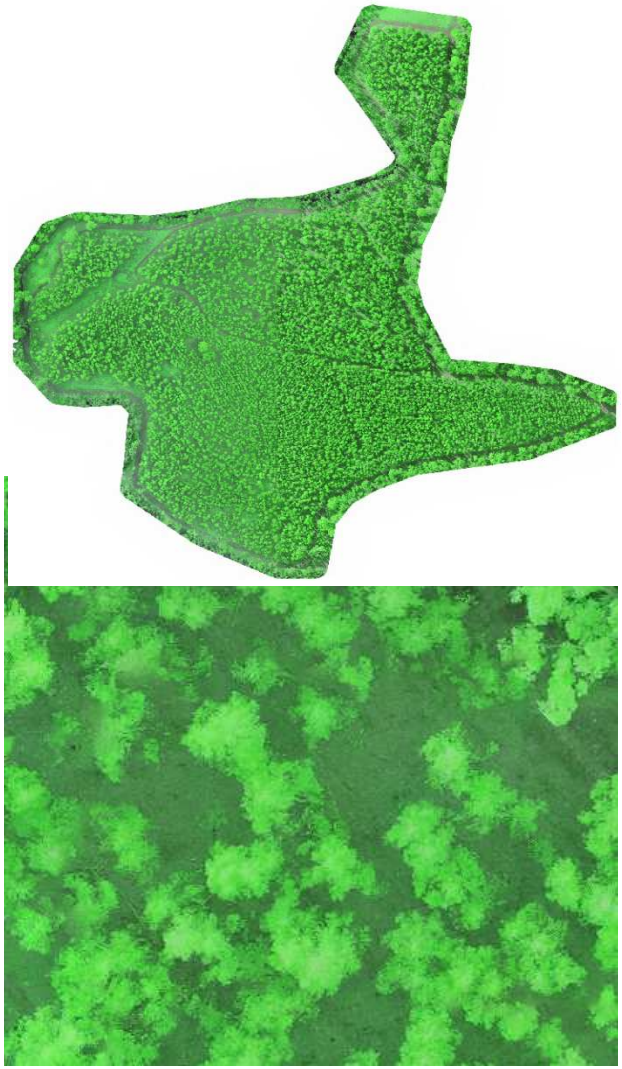


Canopy segmentation using height, NDVI response, canopy size as discriminators.

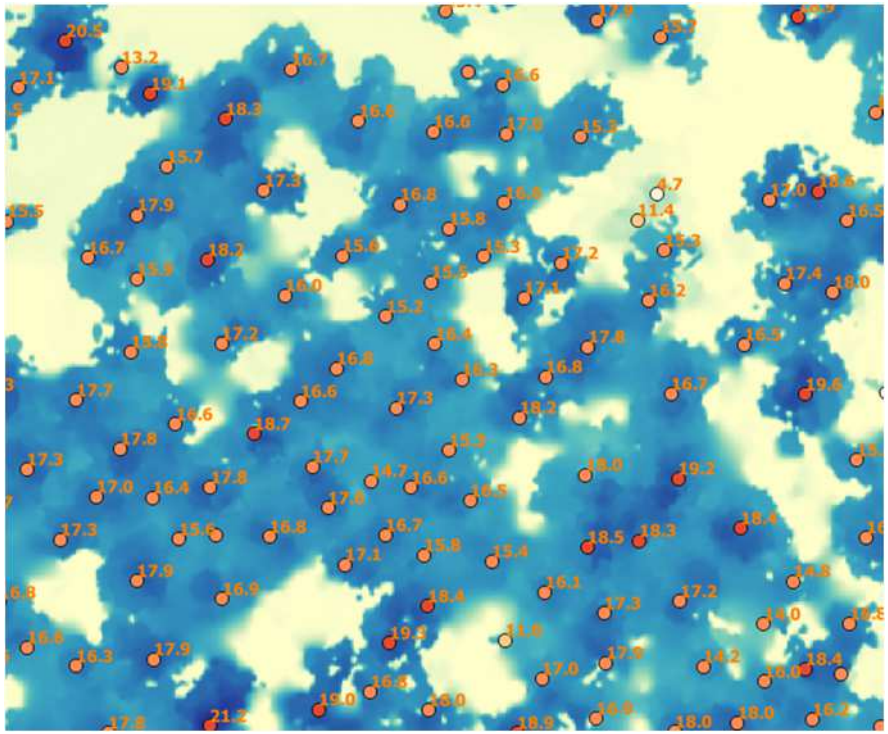
Provides vector file of each plant's location.

C4D INTEL

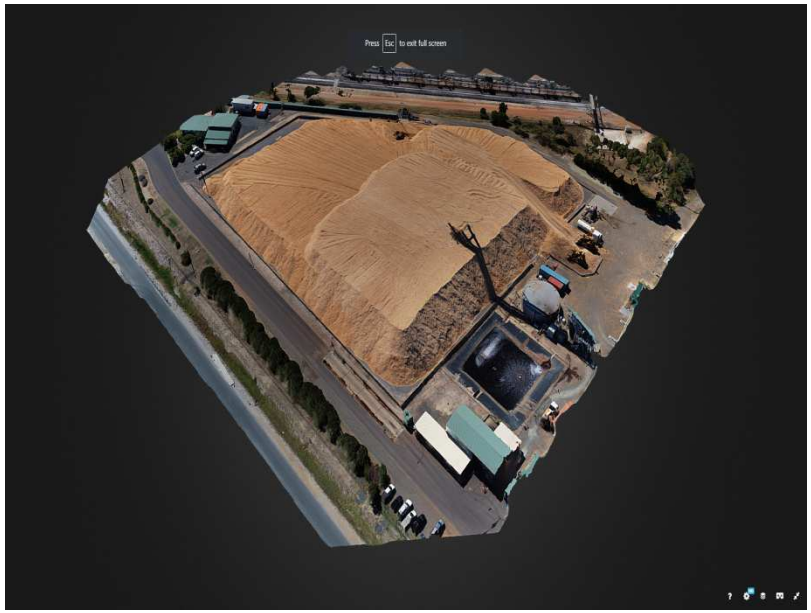
C4D Intel – Forestry 9 Year Old Yield Assessment

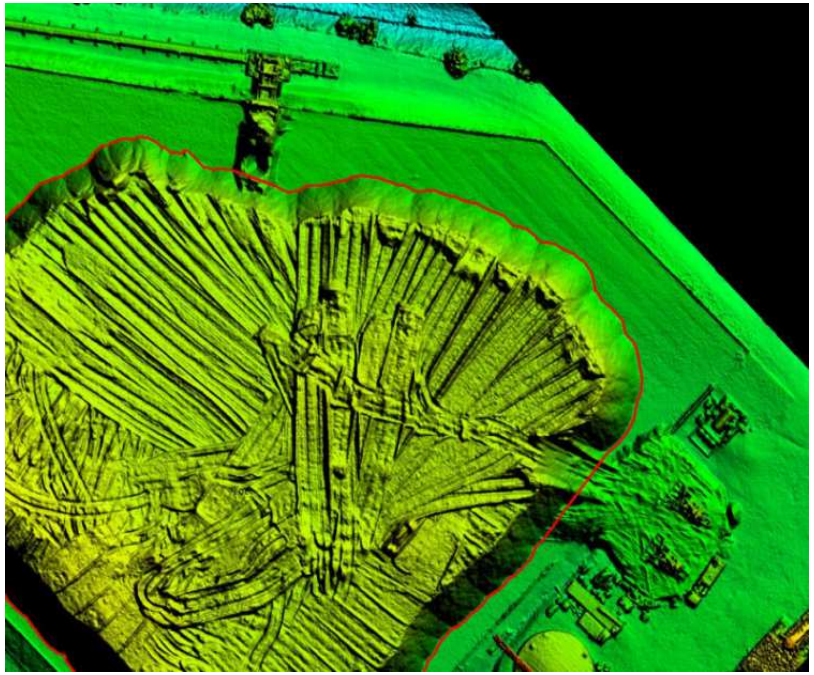


1. Segment individual canopies based on canopy height model
2. Calculate maximum height of each tree for taper function



C4D Intel – Forestry Woodchip Volumetric Survey

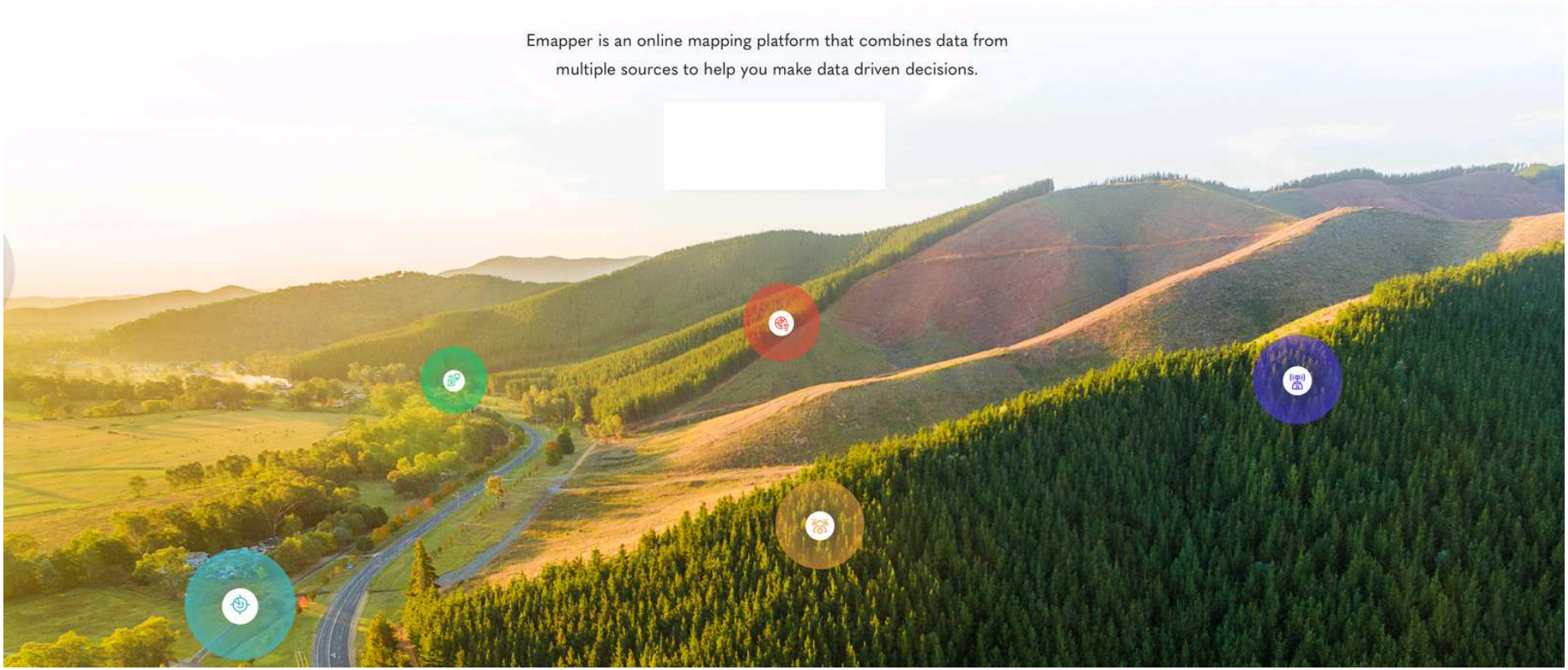




emapper

Monitor and manage your environmental activities, impacts and outcomes

Emapper is an online mapping platform that combines data from multiple sources to help you make data driven decisions.



- **emapper** is an environmental data platform combining remote sensing, fixed sensor and digital biological field data
- The **emapper** platform offers a monitoring marketplace (data and analytics) and decision support tools for environmental managers
- Our first application supports mine site environmental management focusing on rehabilitation performance monitoring

emapper

METS IGNITED
Engage in our future

METS Ignited Project

- METS Ignited is an Industry-led, Federal Government-funded, growth centre for the Mining Equipment, Technology and Services (METS) sector.
- In May 2018 **emapper** commenced a 2 year AU$2.4M METS Ignited sponsored project to build out the **emapper** platform for rehabilitation and environmental management activities.

  53 monitoring activities over 3 operations (testing / requirements & specifications)

Mining Industry

ROY HILL

Mount Gibson Iron

AngloAmerican

Environmental and Remote Sensing Specialists

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Platform Developers and Integrators

eagle.io

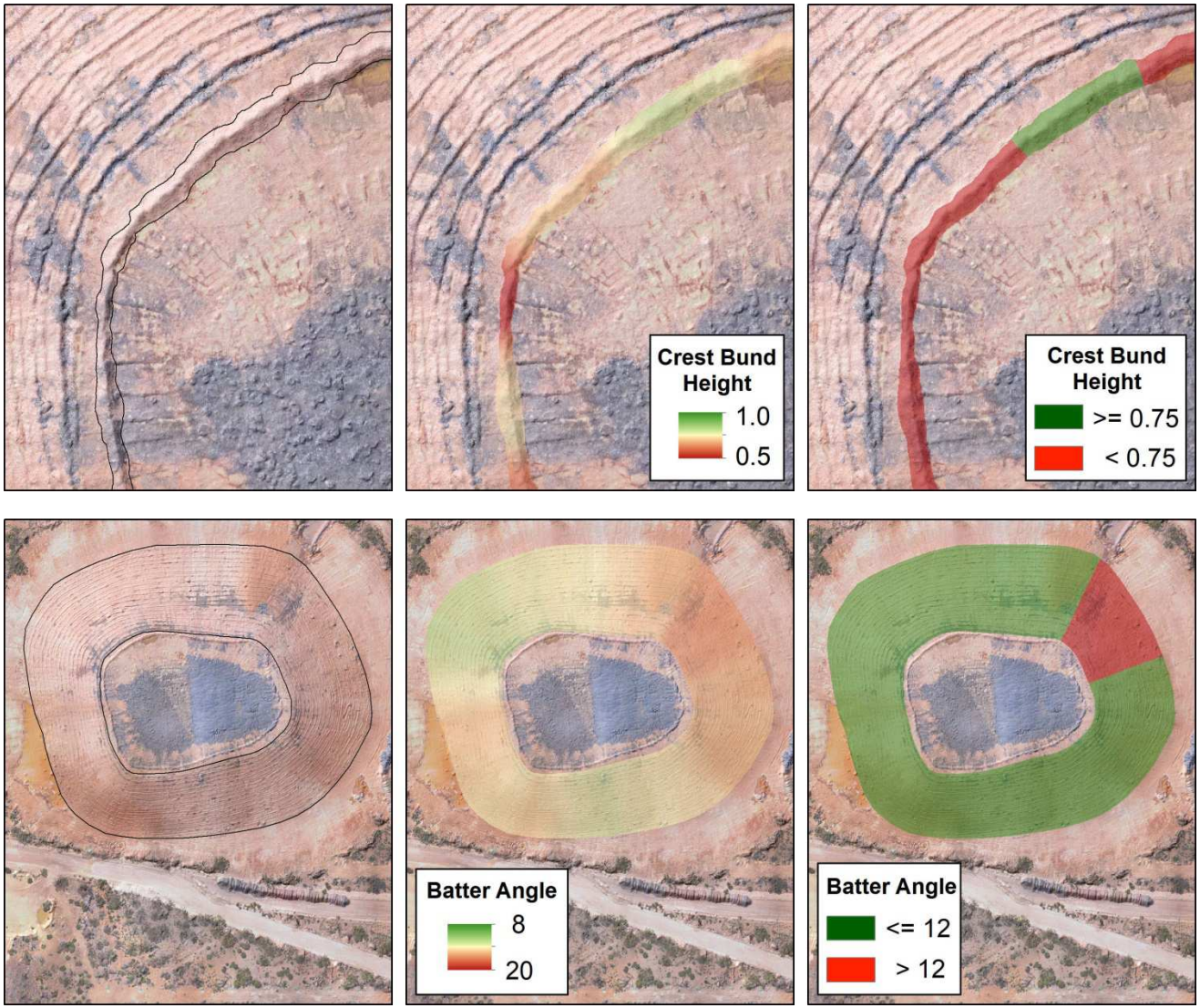
SOLAIS GEOINFORMATICS

emapper - Rehabilitation Performance Metrics

Waste Rock Dump Encapsulation

- Waste rock that has Acid Rock Drainage potentials, salinity or dispersive material
- Require correct design; height, angle, cover material & vegetation cover to inhibit erosion
- Previously monitored using transects

emapper RPM - Geometry

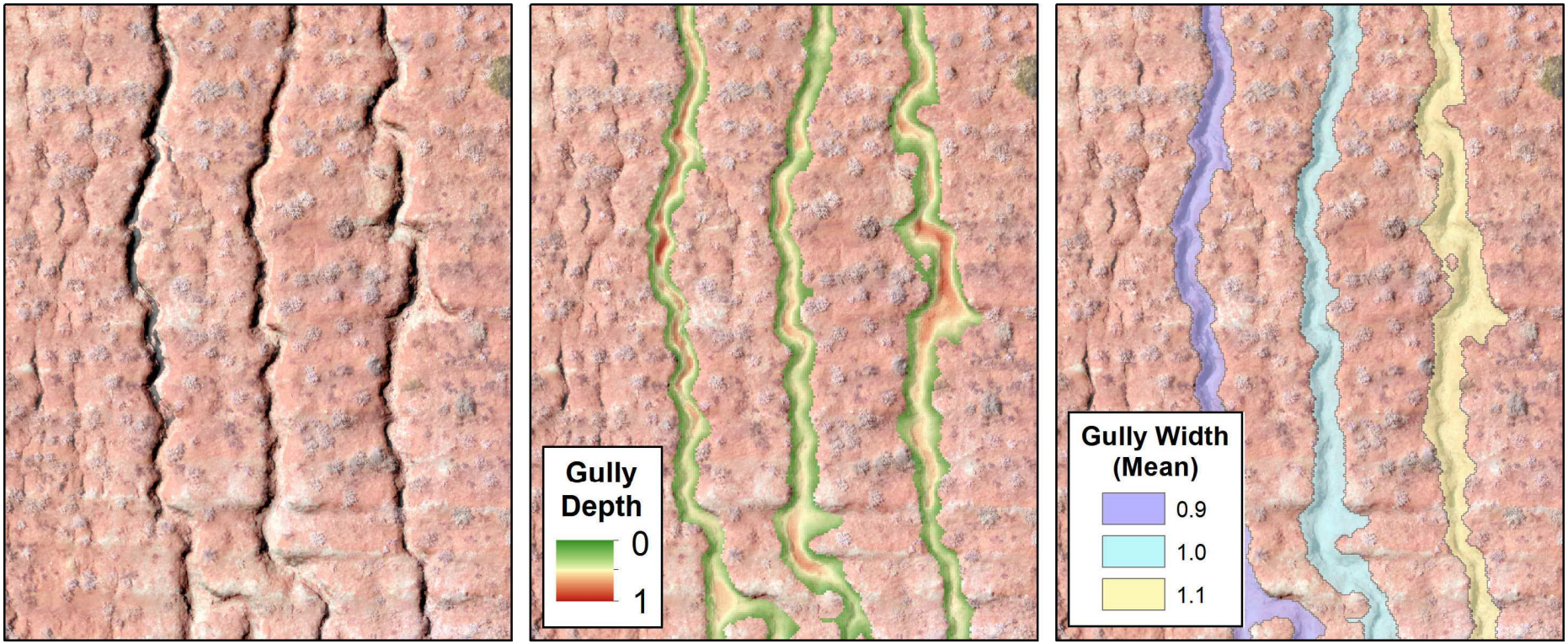


Deconstruct Geometry

- Heights
- Widths
- Slope Angles

Compare Against Completion Criterion

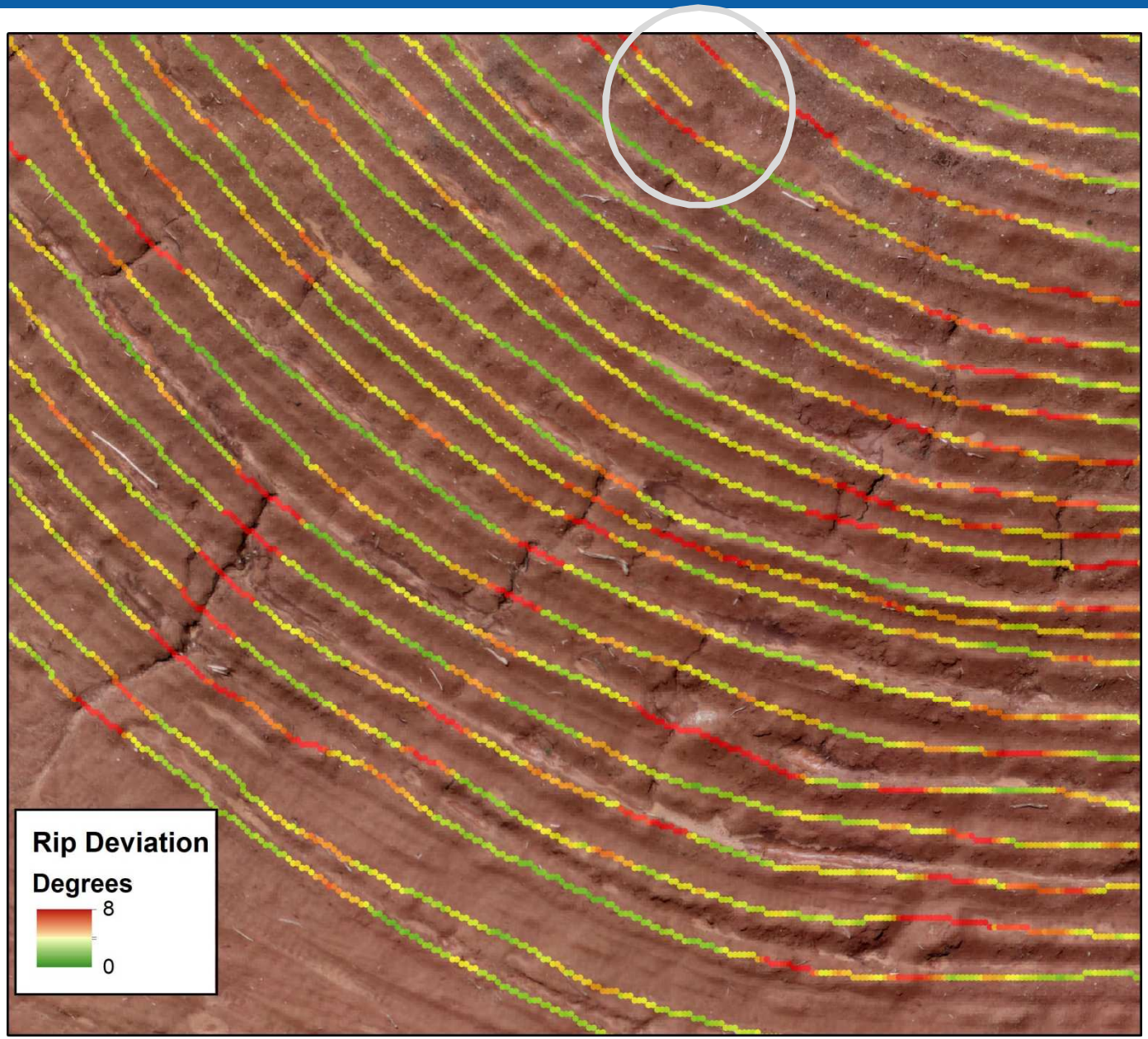
emapper RPM - Stability



Stability - Gullies

- Detection
- Depth
- Width
- Distribution – Frequency and Clustering

RPM In Use – Landform Construction



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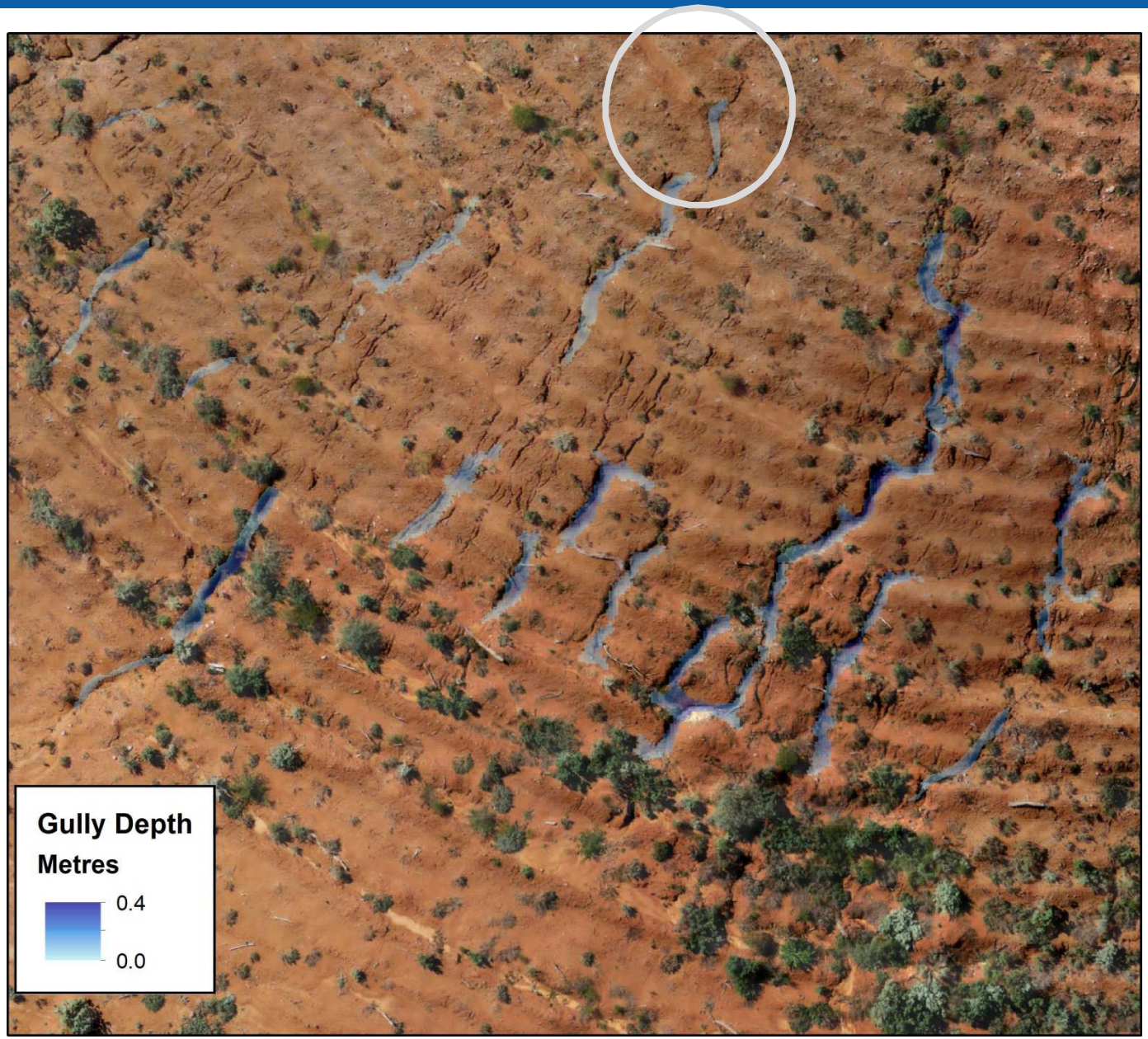
RPM In Use – Landform Construction



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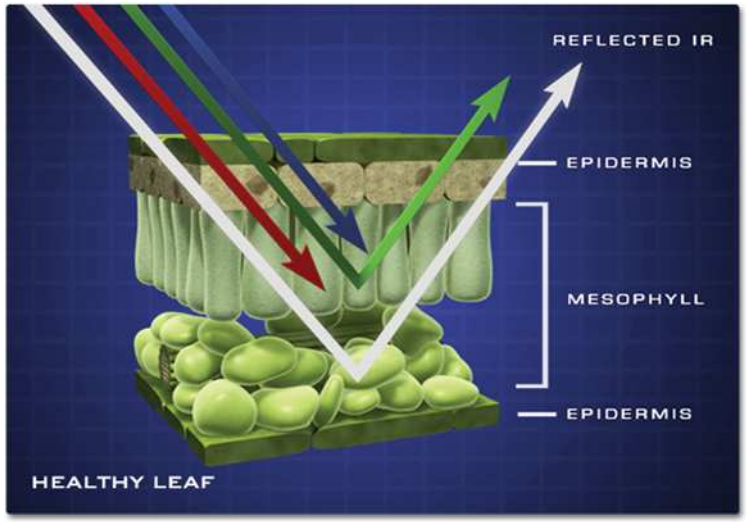
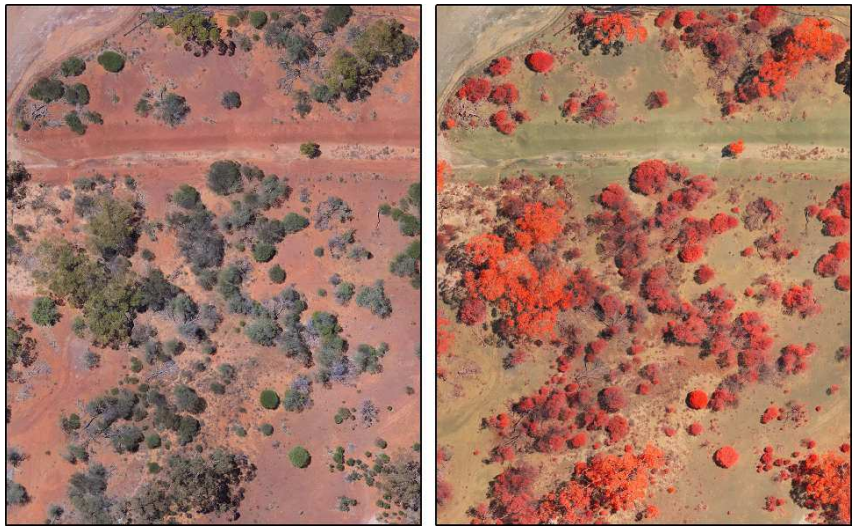
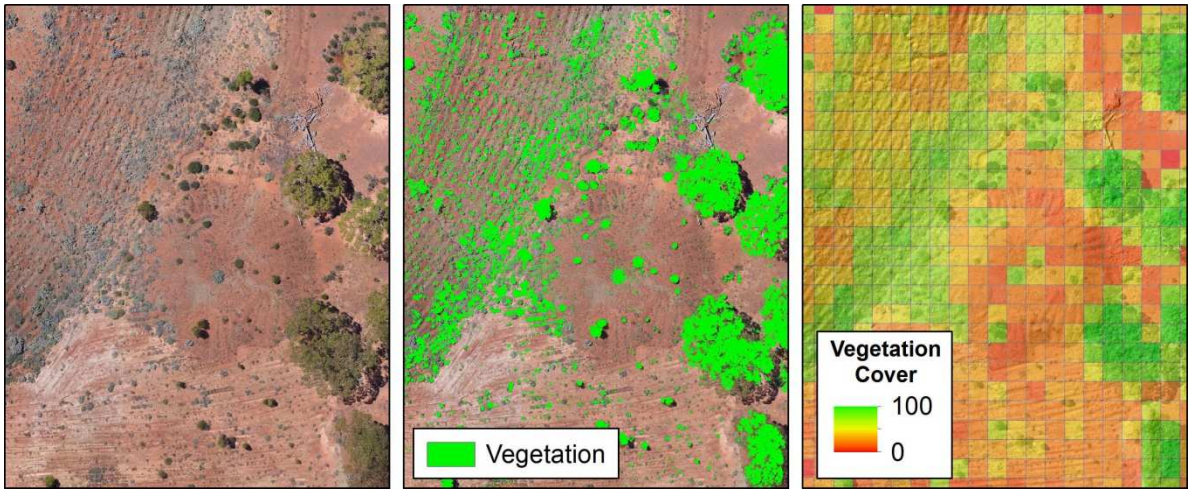
emapper RPM – Vegetation (Spectral)



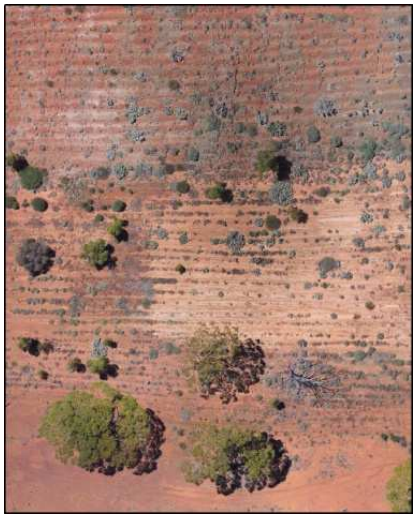


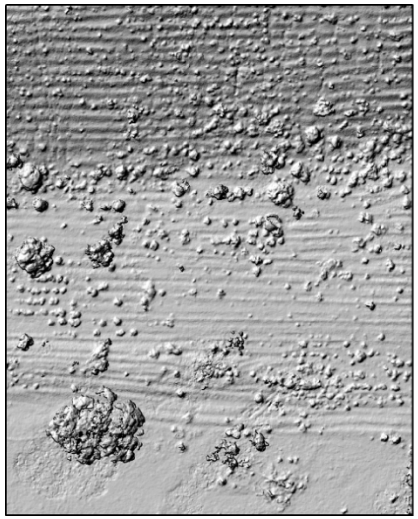


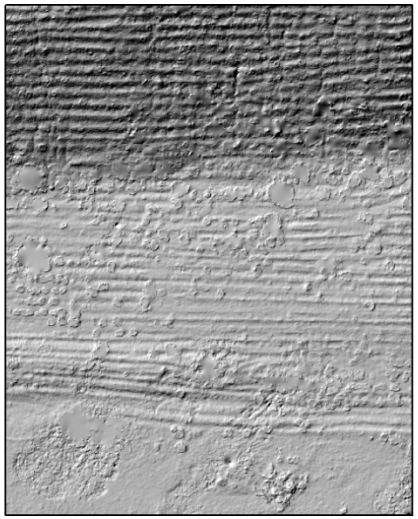
Multispectral Indices

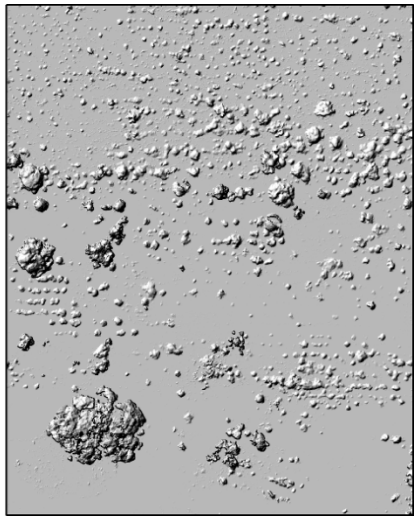
- Condition
- Cover

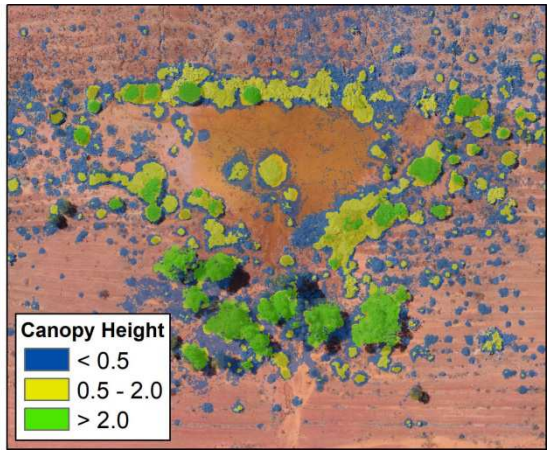
emapper RPM – Vegetation (Structural)











Structure

- Point Cloud Filtering
- Vegetation Height

REMOTE SENSING DATA
Rehabilitation Performance Metrics

Geometry : Landform Geometrical Properties

Stability : Landform Stability Indicators

Vegetation : Landform Vegetation Characteristics

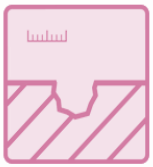

Batter Height


Batter Slope Angle


Batter Slope Length


Batter Ripping Deviation


Gully Depth


Gully Width


Vegetation Cover

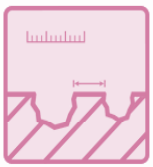

Vegetation Health


Berm Width


Berm Slope Angle


Crest Bund Width


Crest Bund Height


Gully Spacing


Gully Cover

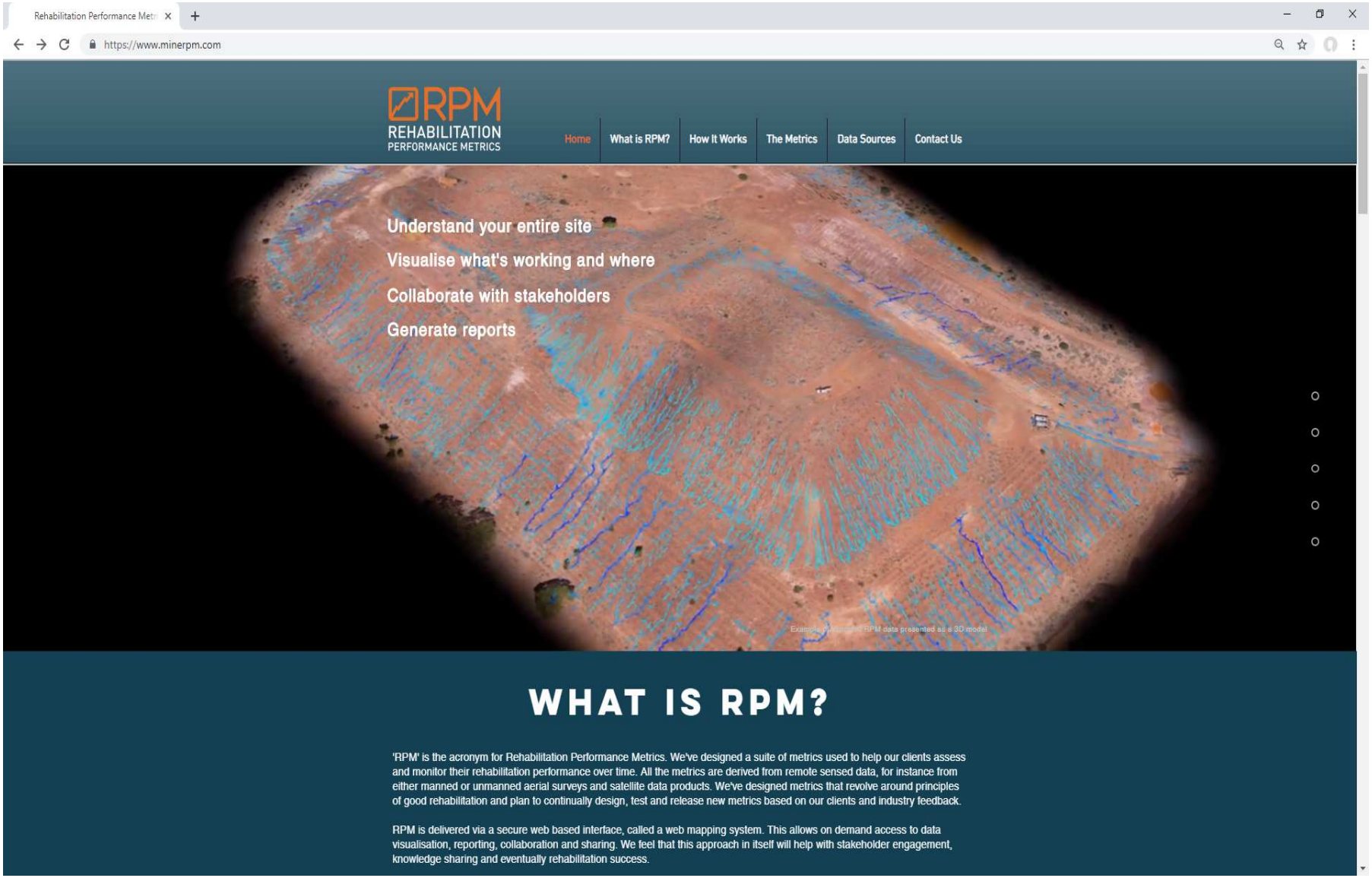

Vegetation Height


Abandonment Bund Height


Abandonment Bund Width

https://www.minerpm.com/

emapper – www.minerpm.com

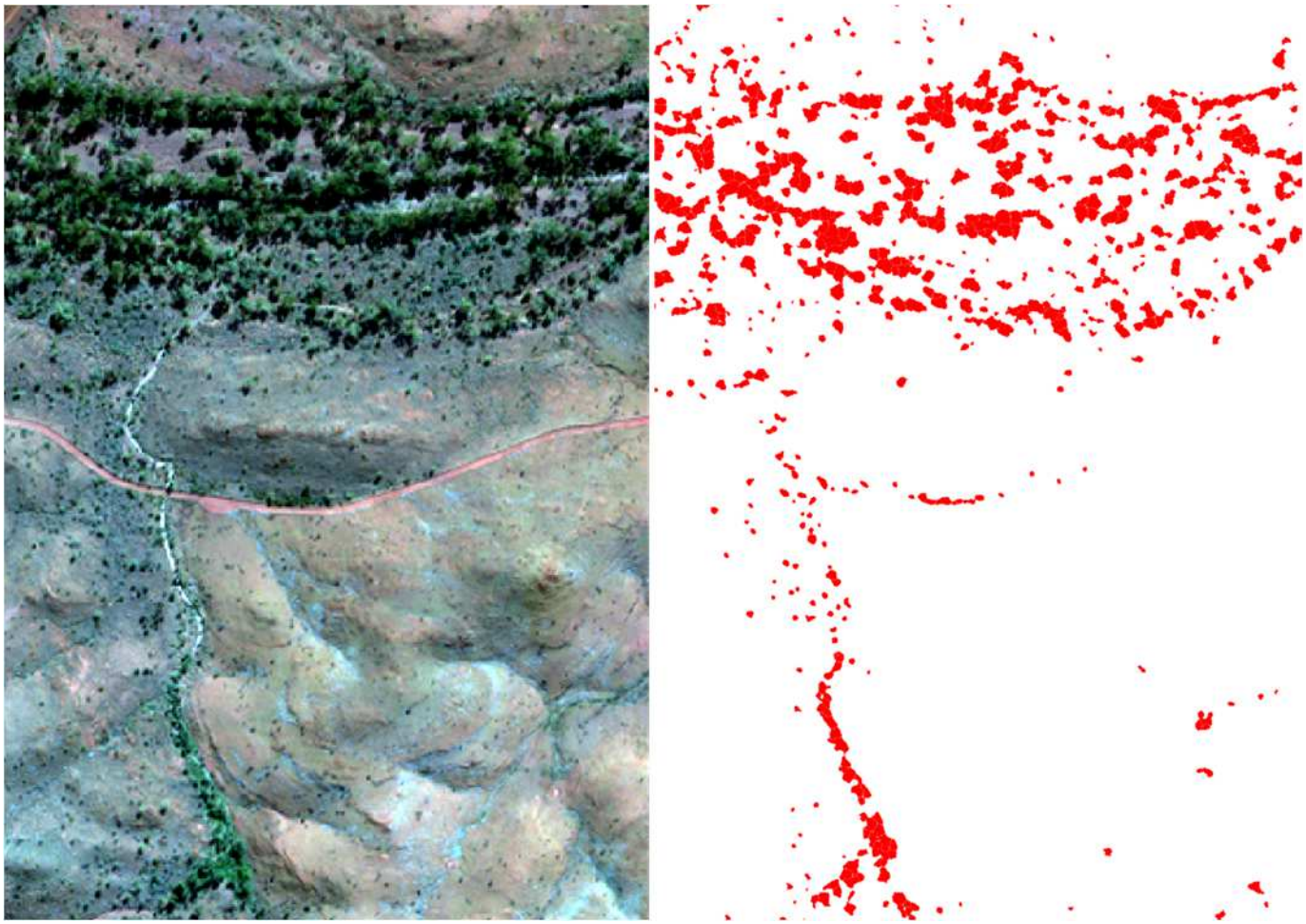


Astron – Riparian Vegetation Monitoring

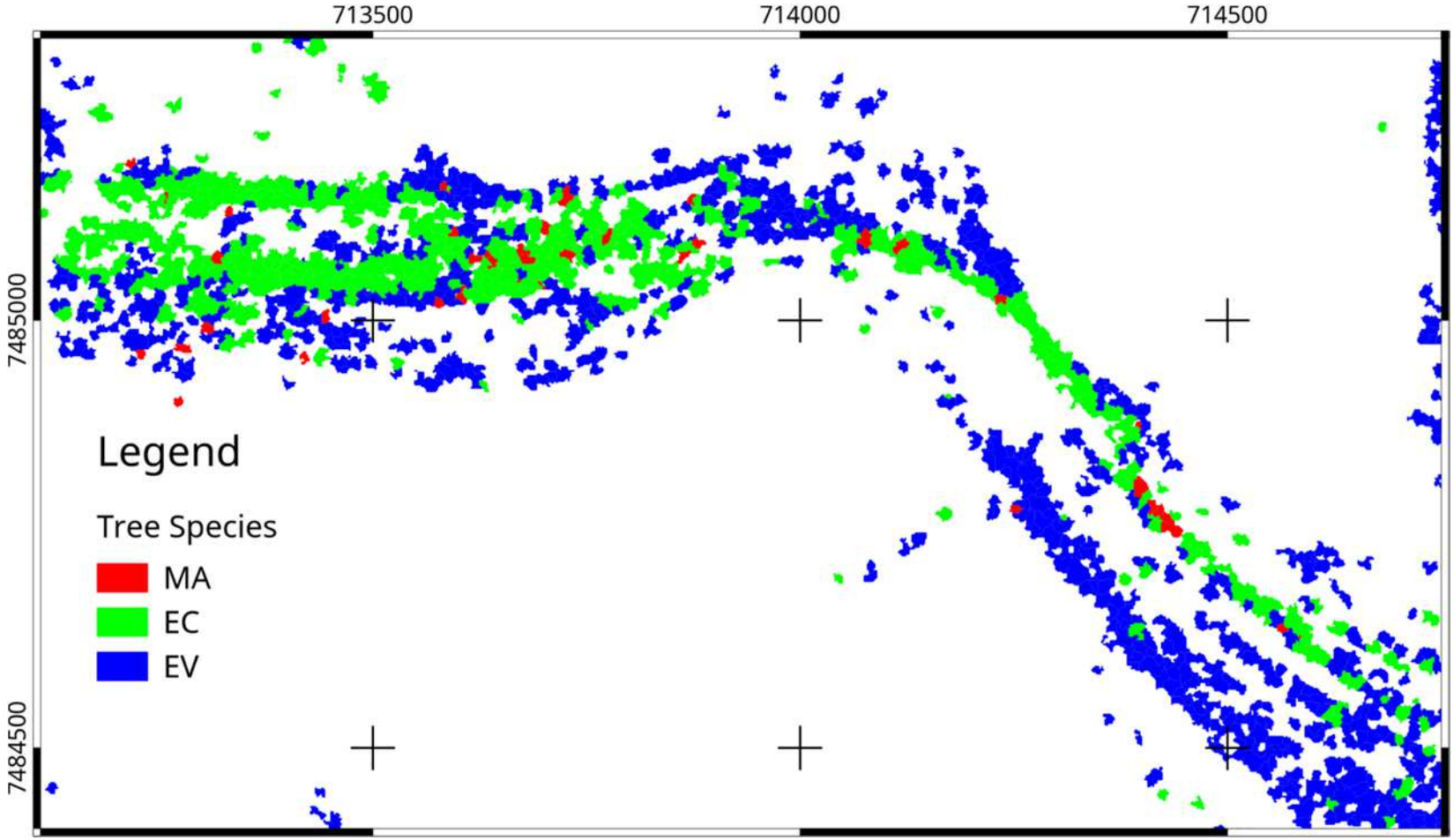
Potential Impacts

- Drawdown Impacts (Groundwater Dependent Ecosystem - GDE)
- Discharge Impacts (all vegetation)
- Surface Flow Disruption (relevant also to Mulga and clay pan vegetation)

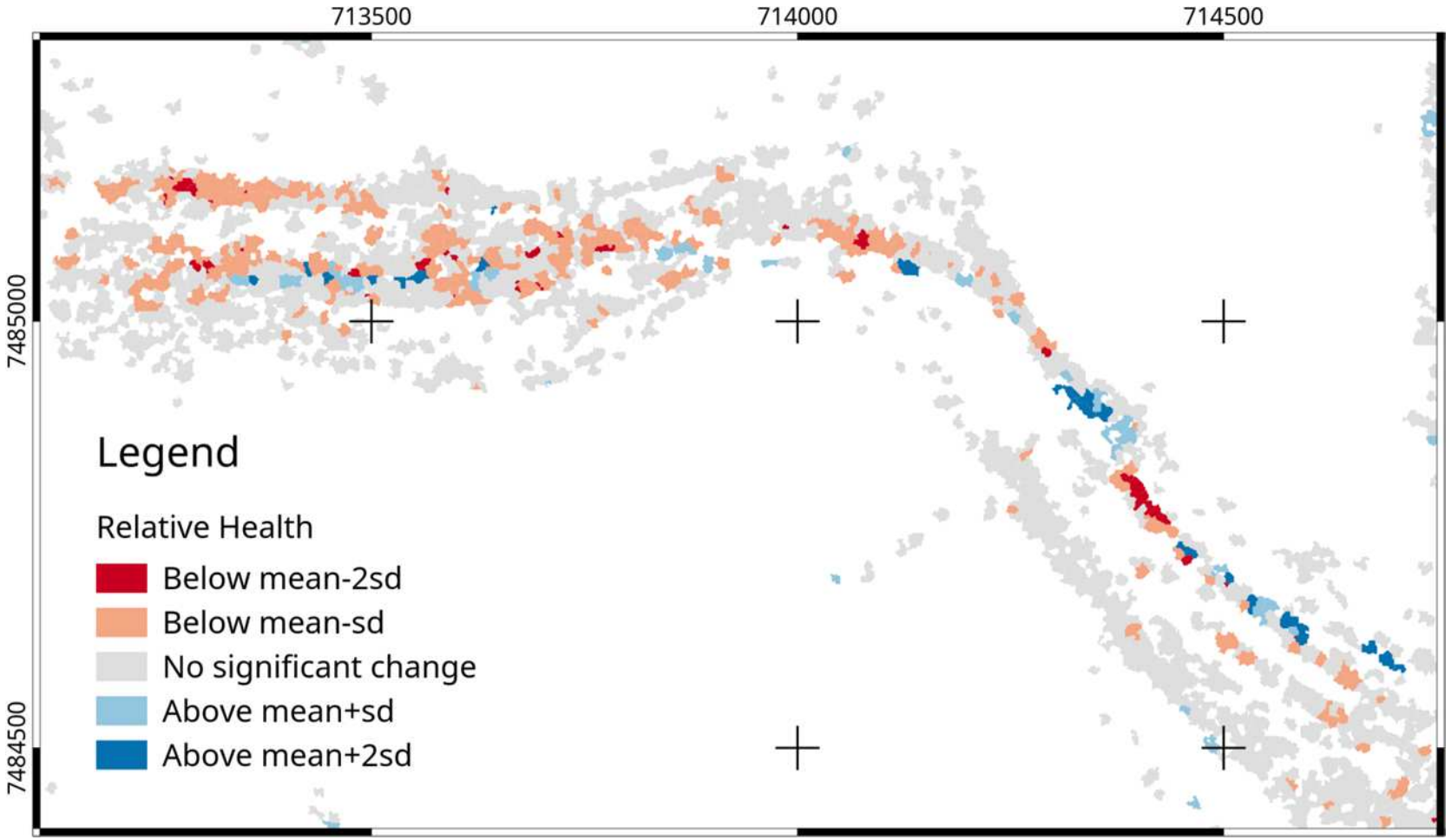
Astron – Riparian Vegetation Monitoring Segmentation



Astron – Riparian Vegetation Monitoring Classification

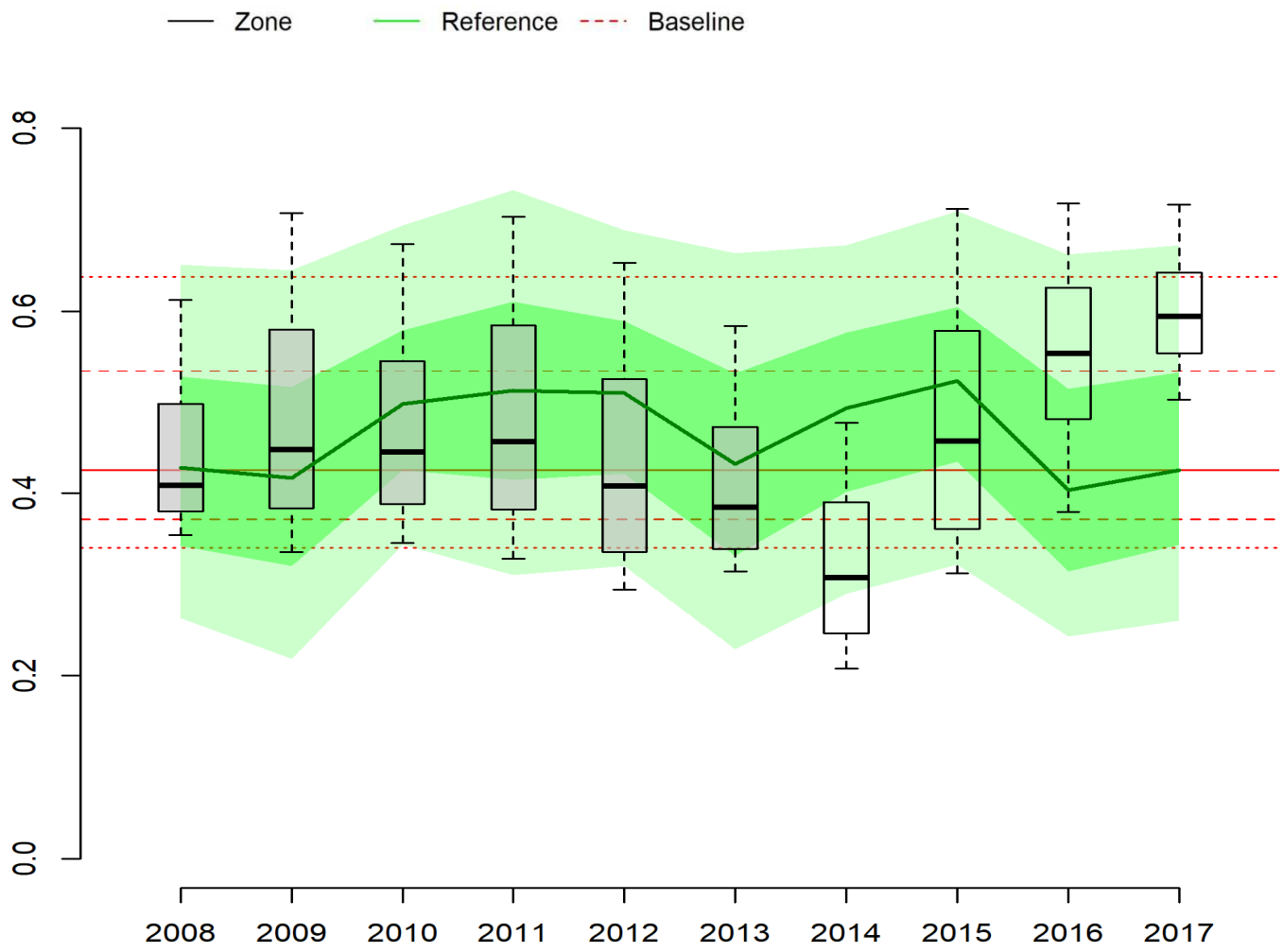


Astron – Riparian Vegetation Monitoring Classification



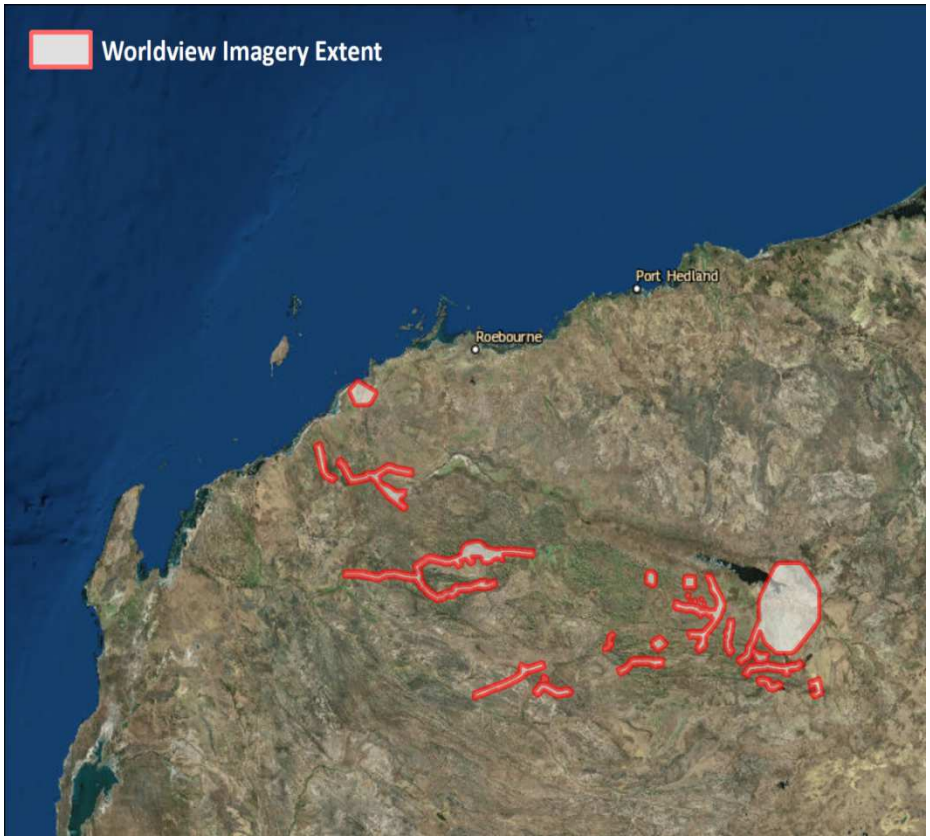
Astron – Riparian Vegetation Monitoring Classification

Time Series Vegetation Index

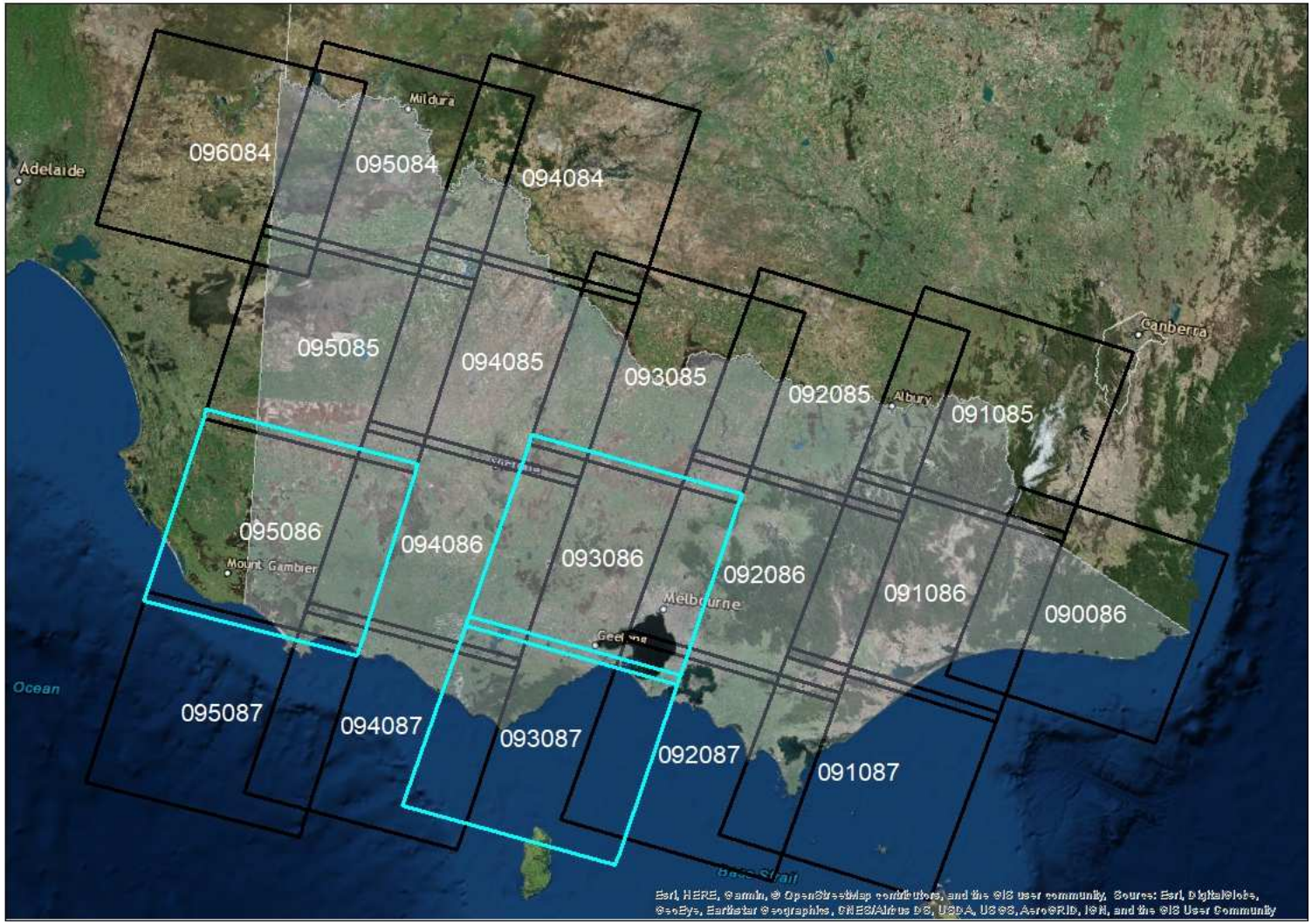


Astron – Riparian Vegetation Monitoring Outcomes

- Cost reduction e.g. +40%
- Reduced field time and HSE risk
- Confidence that entire impact zone is being monitored
- Greater sensitivity (more detection power)
- Remote sensing is well established in 13 vegetation monitoring programs that we conduct – proven



Astron – Monitoring Victoria's Wetlands



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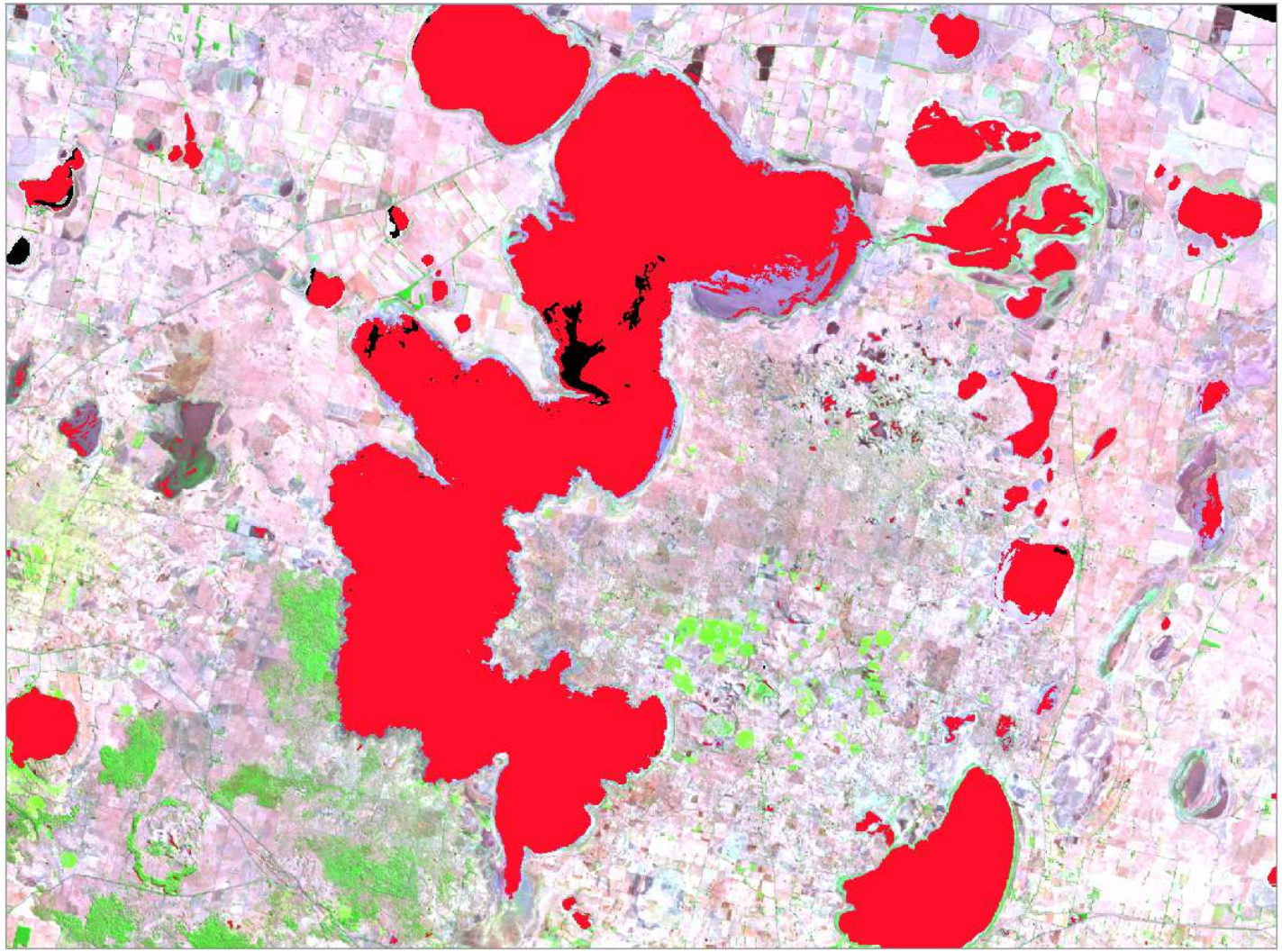

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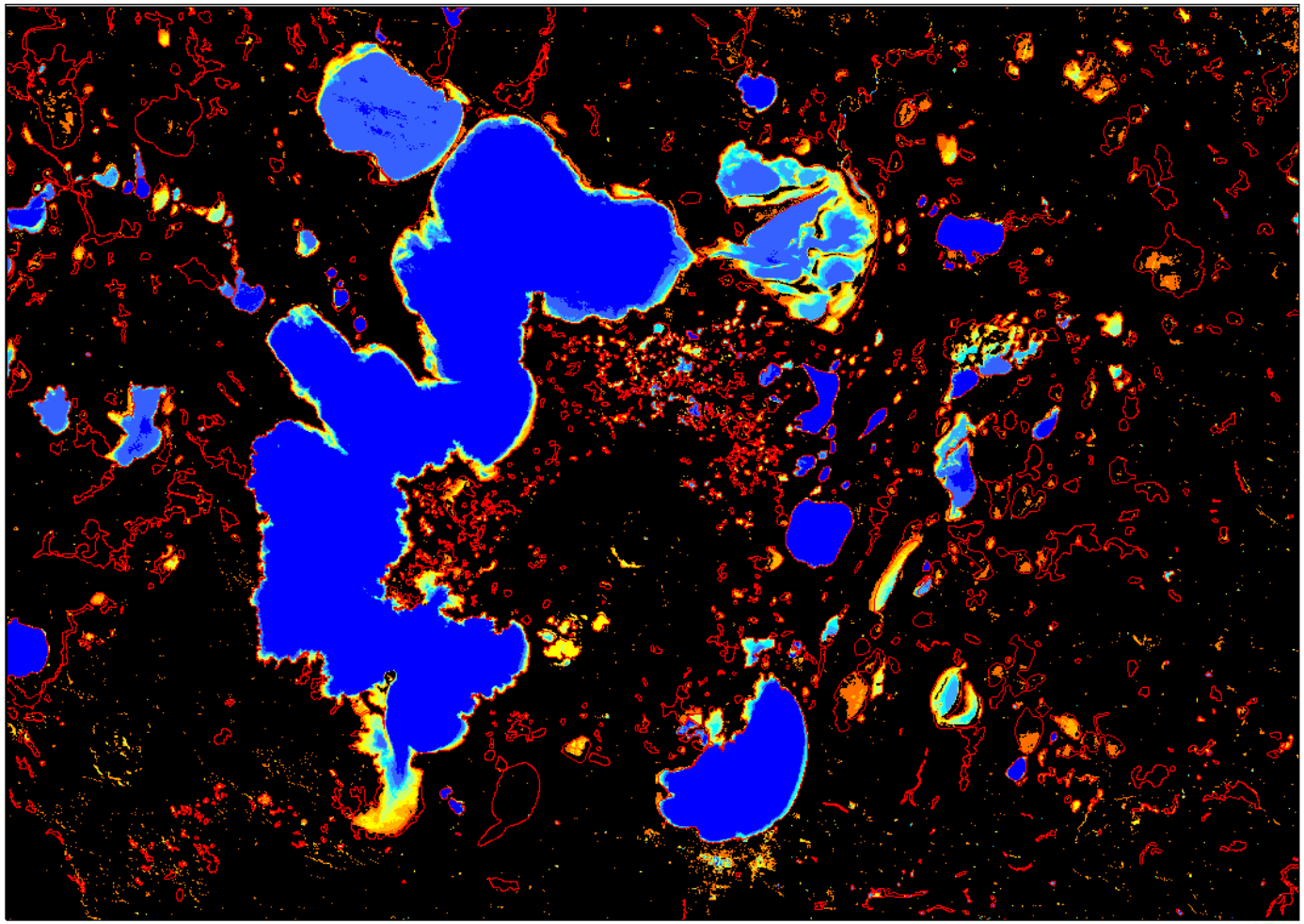

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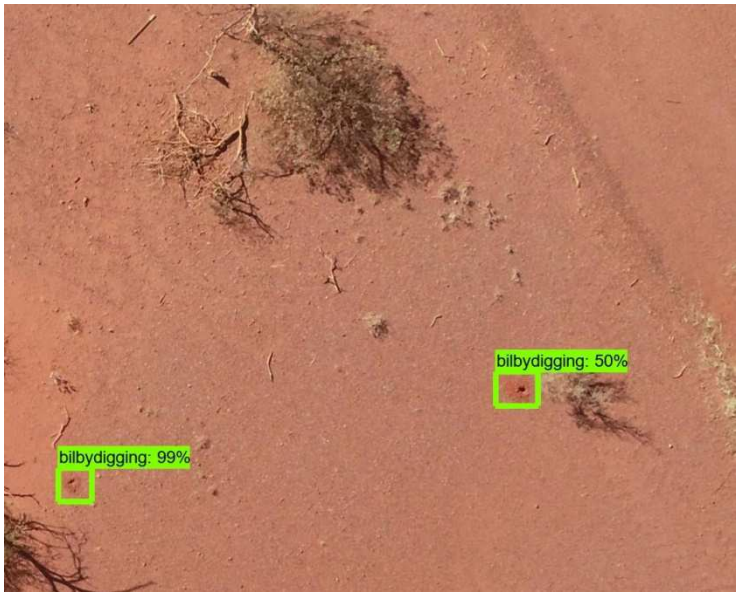
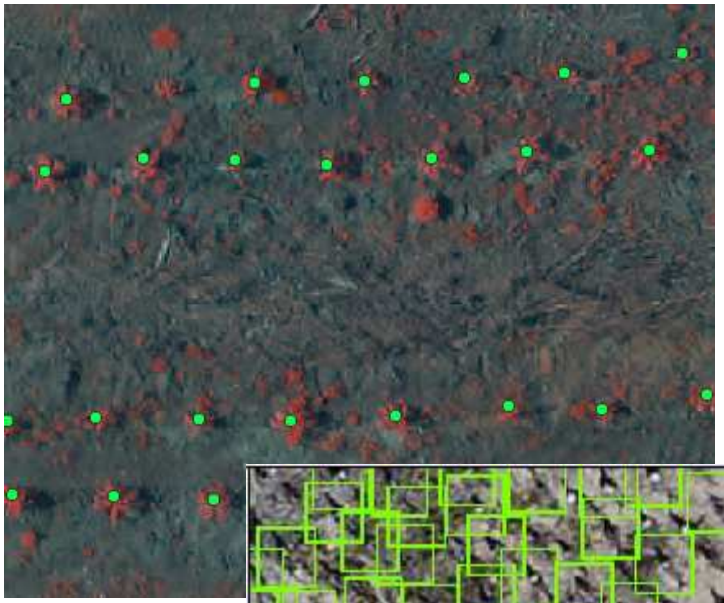
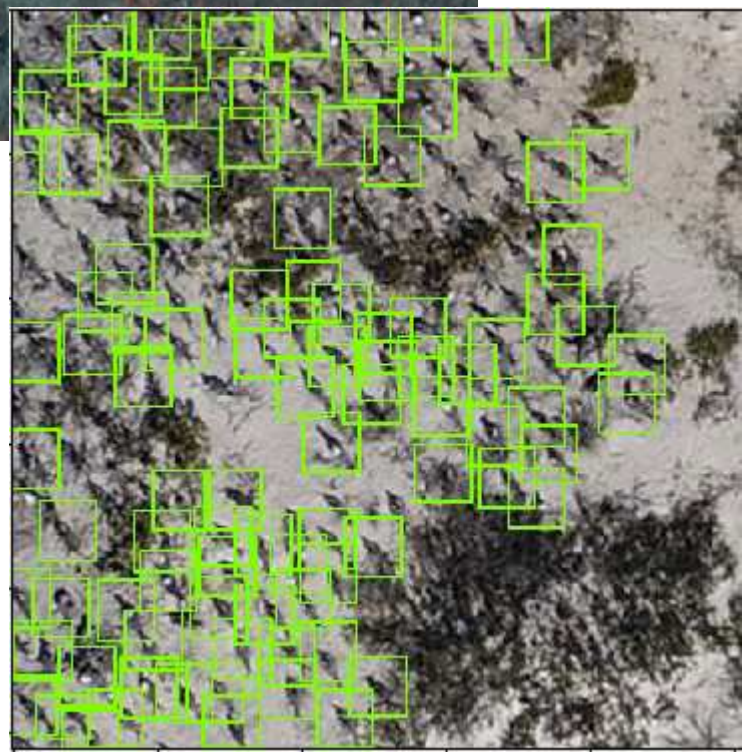
Astron/C4D Intel – Latest Development Work







Deep Learning object detection for detection of Bilby diggings, seedlings amongst weeds and nesting seabirds!

Astron – Further Information

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