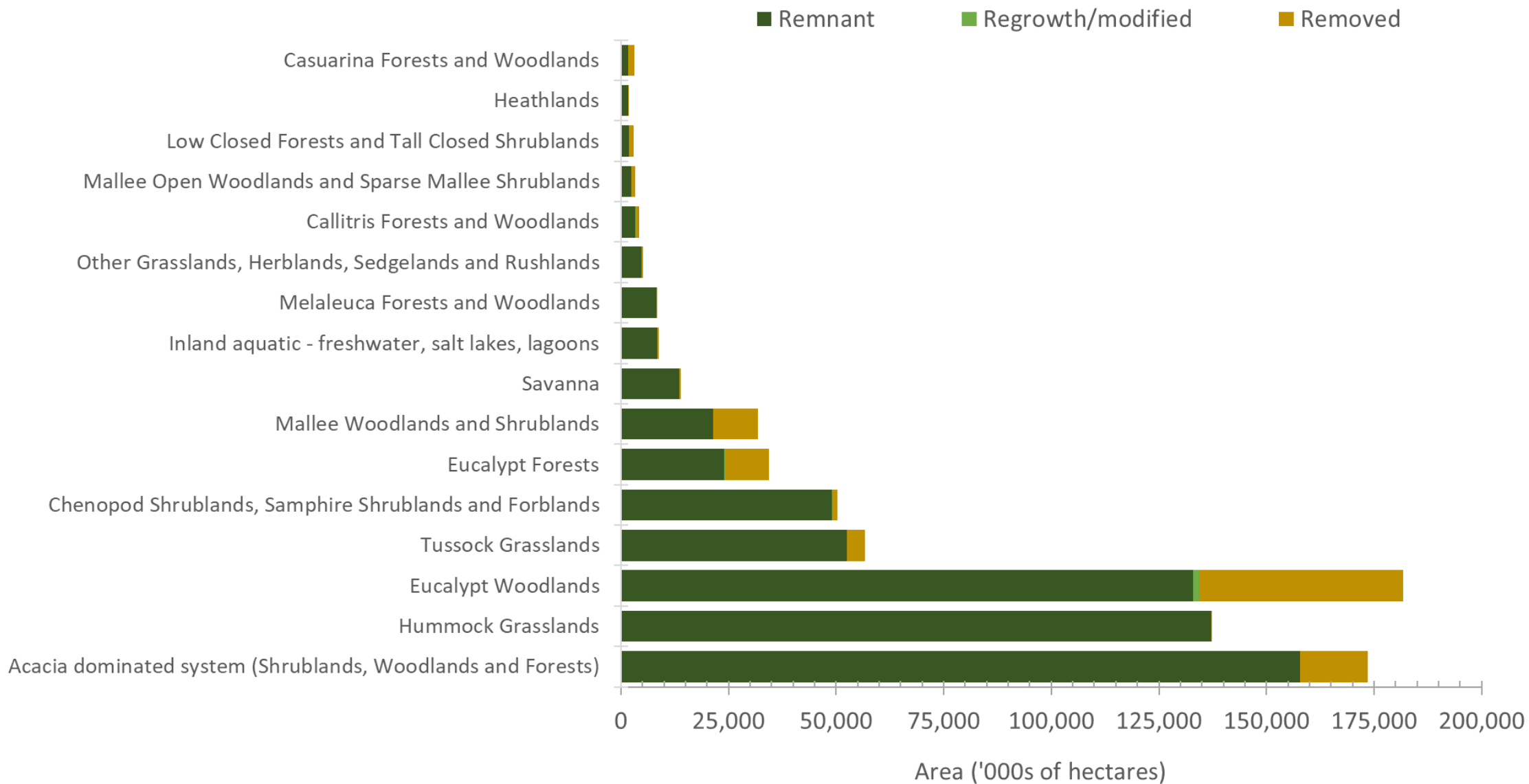
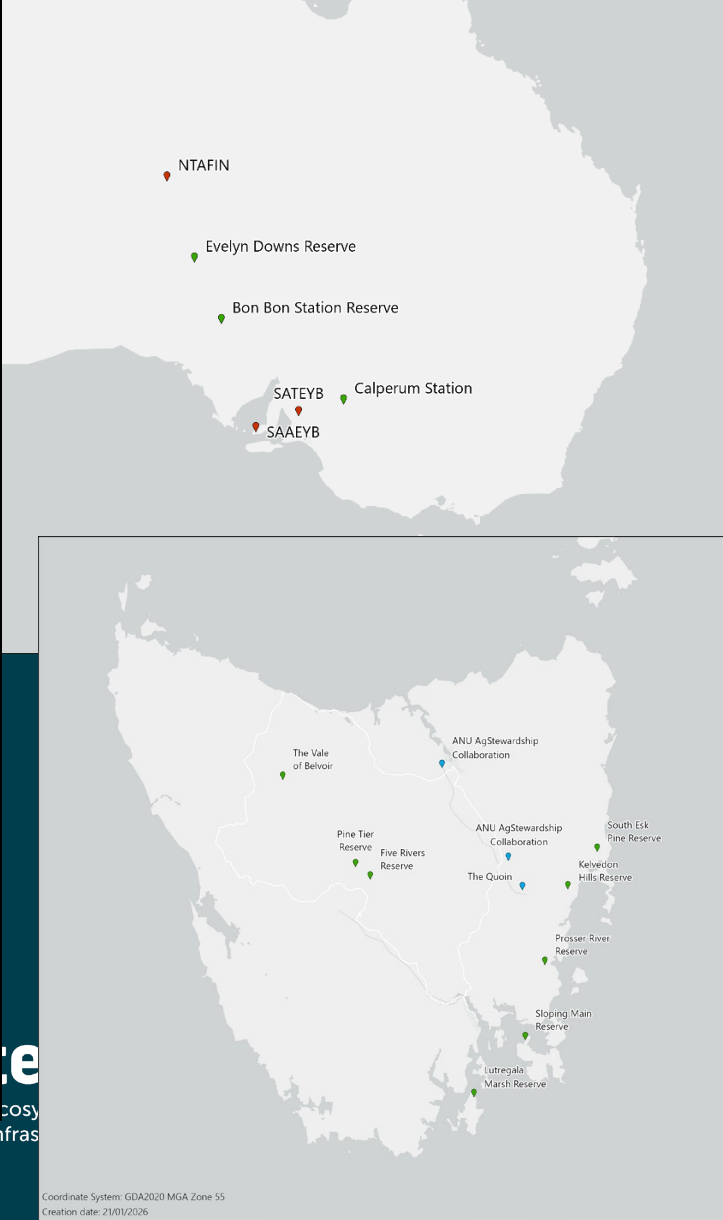




 Validation with Field Data

NatureScan sites to date

		NatureScan sites																
		Calperum Station	South Esk Pine Reserve	The Quoin	SATEYB	SAAEYB	Lutregala Marsh Reserve	NTAFIN	Bon Bon Station Reserve	Pine Tier Reserve	Five Rivers Reserve	ANU AgStewardship Collab	Evelyn Downs Reserve	The Vale of Belvoir	Sloping Main Reserve	Boolcoomatta	Prosser River	Kelvedon Hills
NVIS modified MVGs																		
Acacia Dominated Systems	Acacia Forests and Woodlands																	
	Acacia Open Woodlands							X	X				X					
	Acacia Shrublands							X										
	Hummock Grasslands							X										
Eucalypt Woodlands	Eucalypt Open Woodlands											X	X					
	Eucalypt Woodlands	X	X	X								X	X			#	#	#
	Tussock Grasslands											X	X				#	#
	Chenopod Shrublands, Samphire Shrublands and Forblands	X						X	X				X			#		
Eucalypt Forests	Eucalypt Low Open Forests																	
	Eucalypt Open Forests										X						#	
	Mallee Woodlands and Shrublands	X			X	X												
	Savanna (Tropical Eucalypt Woodlands/Grasslands)																	
	Inland aquatic - freshwater, salt lakes, lagoons						X								X			
	Melaleuca Forests and Woodlands																	#
	Other Grasslands, Herblands, Sedgeland and Rushlands			X						X	X			X				
	Callitris Forests and Woodlands																	
	Mallee Open Woodlands and Sparse Mallee Shrublands	X																
	Low Closed Forests and Tall Closed Shrublands																	
	Heathlands																	
	Casuarina Forests and Woodlands																	





Chenopod shrubland



Eucalypt open woodland



Allocasuarina forests and woodlands



Eucalypt woodland



Eucalypt Open Forest



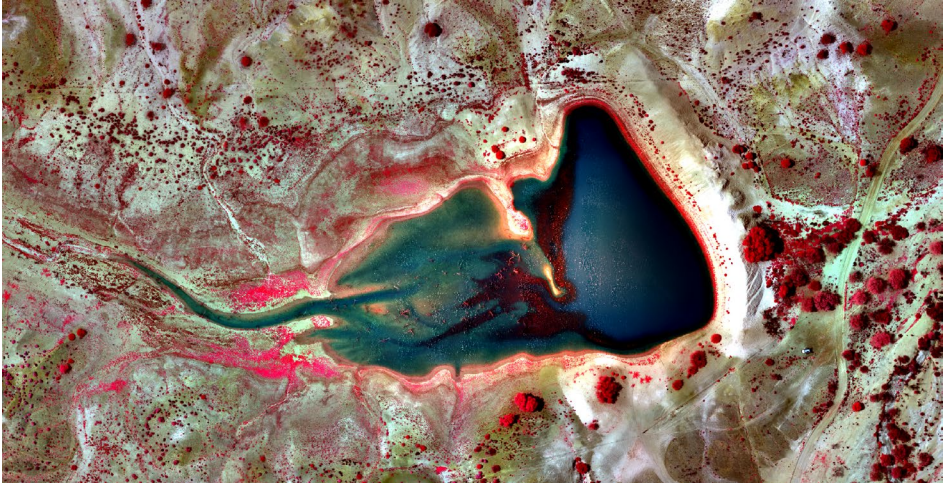
Other: Herbland

Representative NVIS MVGs sampled with drone and field data



Representative NVIS MVGs sampled with drone and field data

Restoration and regeneration case studies



Evelyn Downs
Monitoring impact of destocking in rangelands



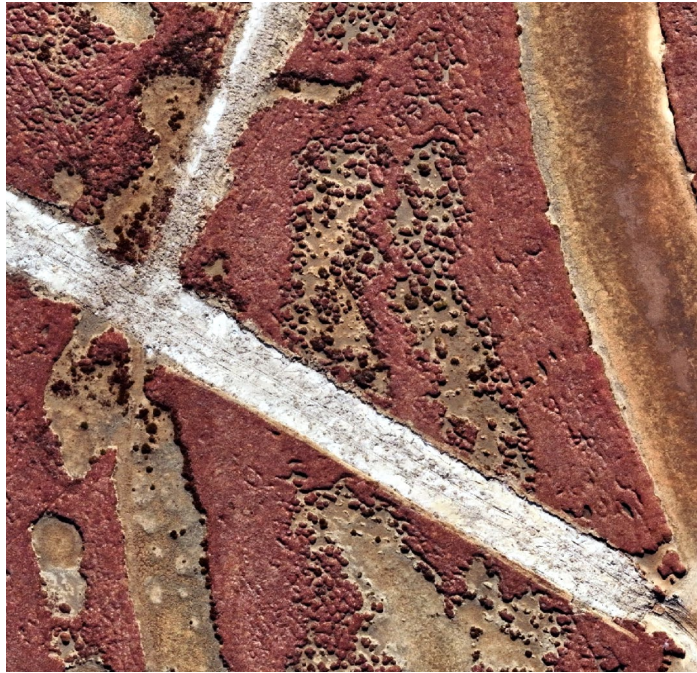
Pine Tier
Monitoring native grasslands



The Quoin
Increasing landscape connectivity



South Esk Pine
Native forest management



Sloping Main Reserve
Mapping saltmarsh hydrological restoration



The Quoin

Increasing landscape connectivity through islet planting



May 2024



August 2024



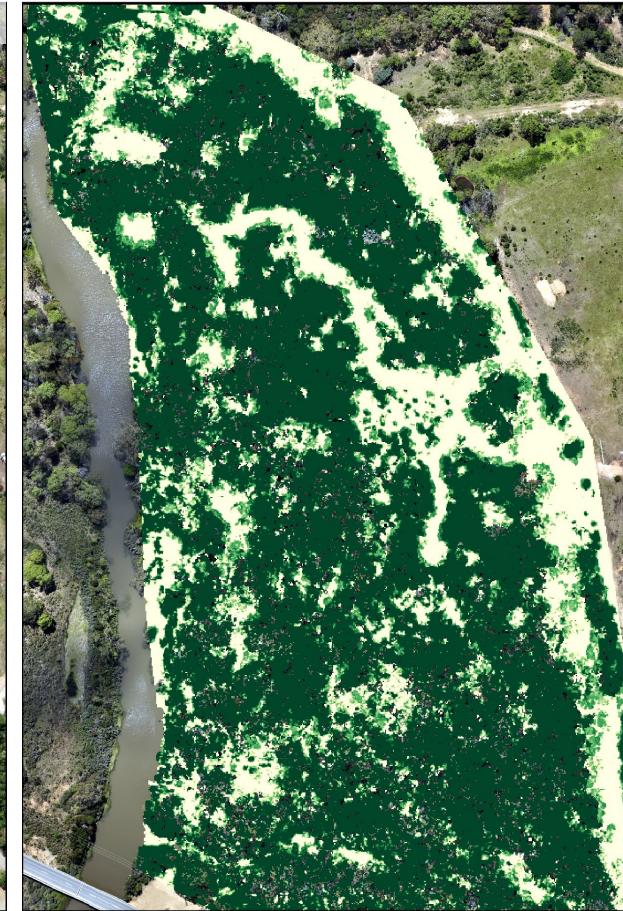
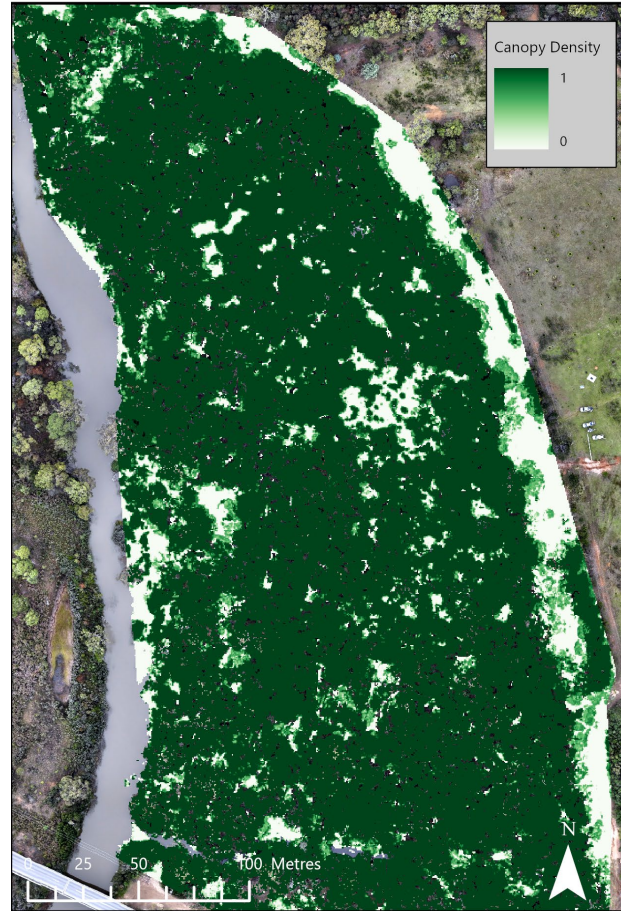
October 2024



February 2025

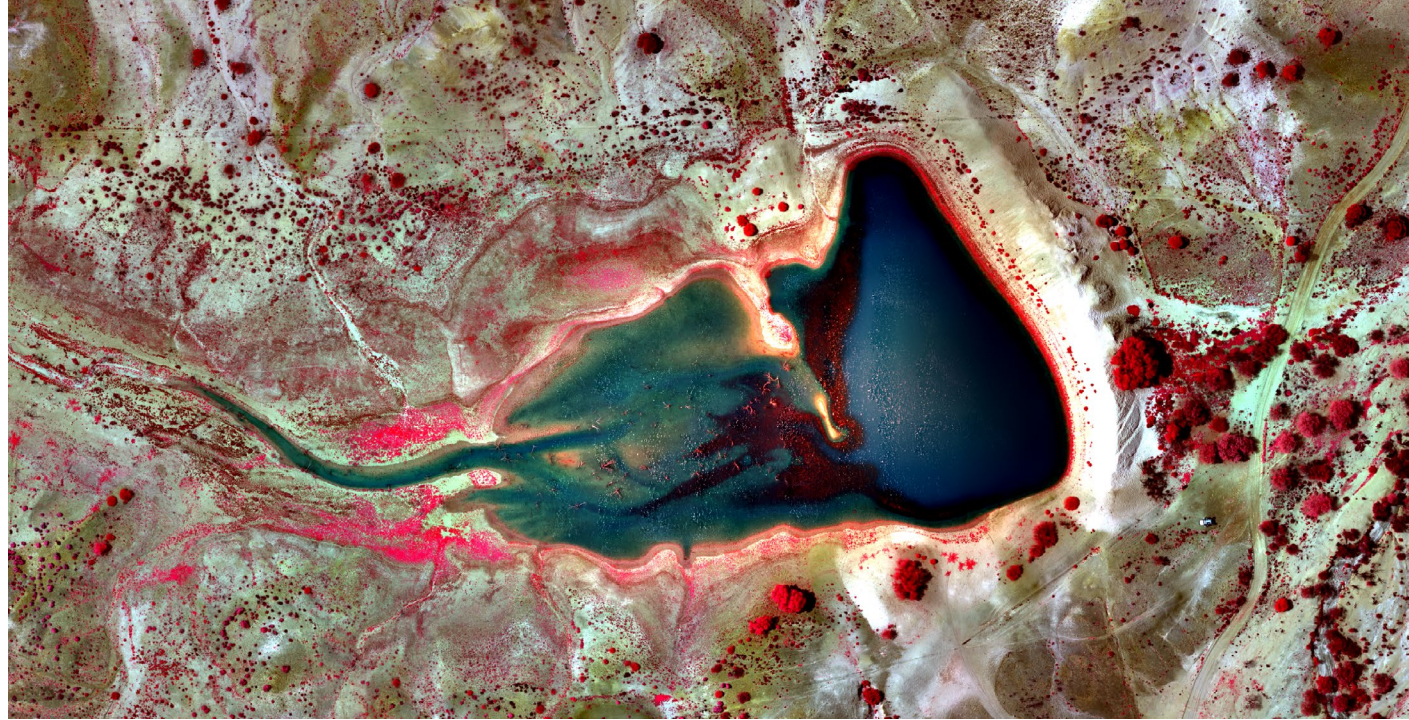
South Esk Pine: TCNSTSE001

Canopy density



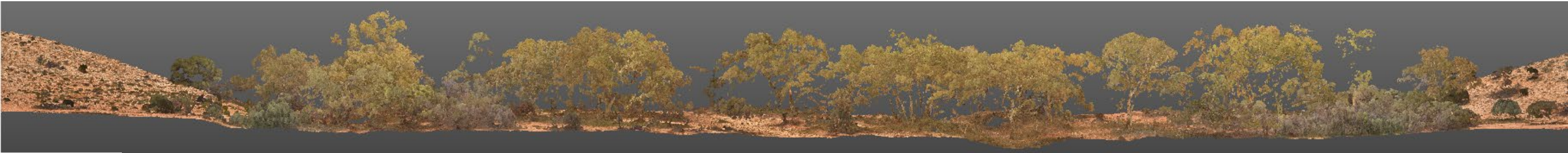


NatureScan: restoration and regeneration Bush Heritage Australia
Evelyn Downs Reserve, SA: impact of destocking in the semi-arid rangelands.



Evelyn Downs: SANSSTP005

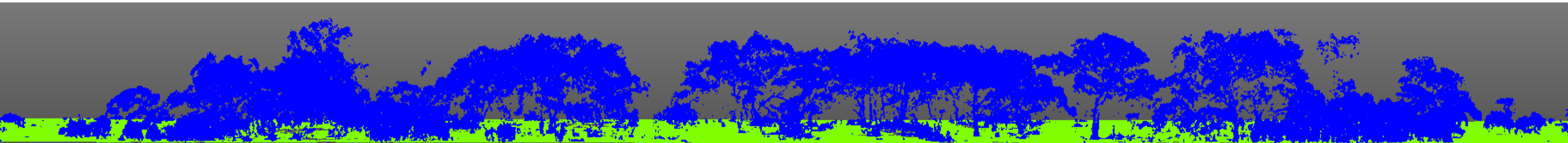
Structural variability, canopy cover and canopy health metrics



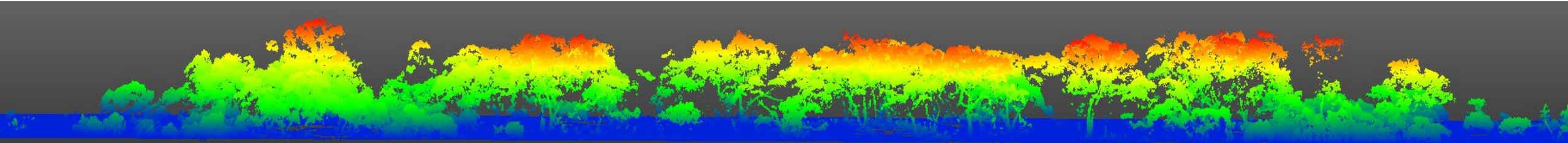
SfM point cloud



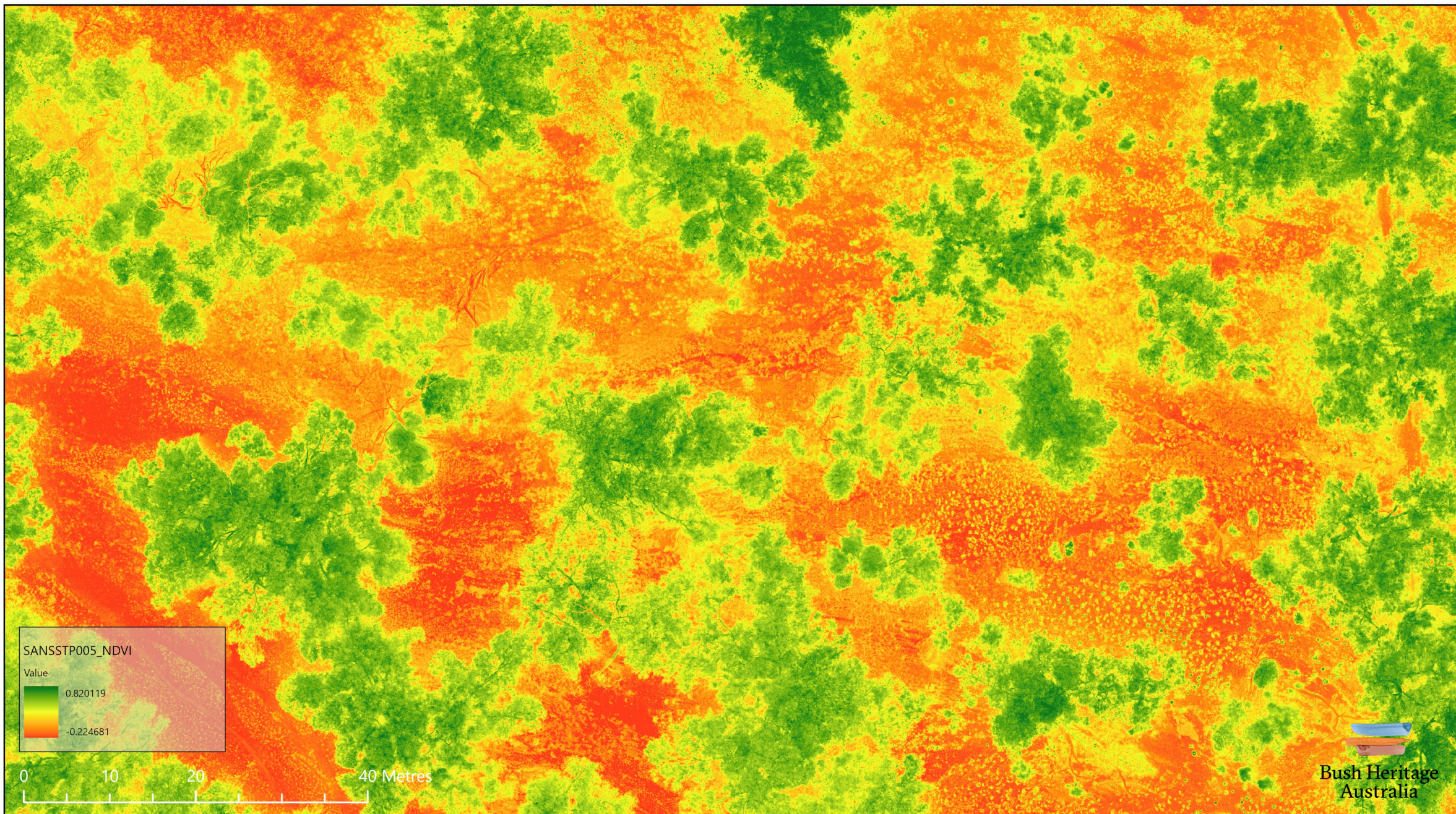
SfM point cloud - normalised

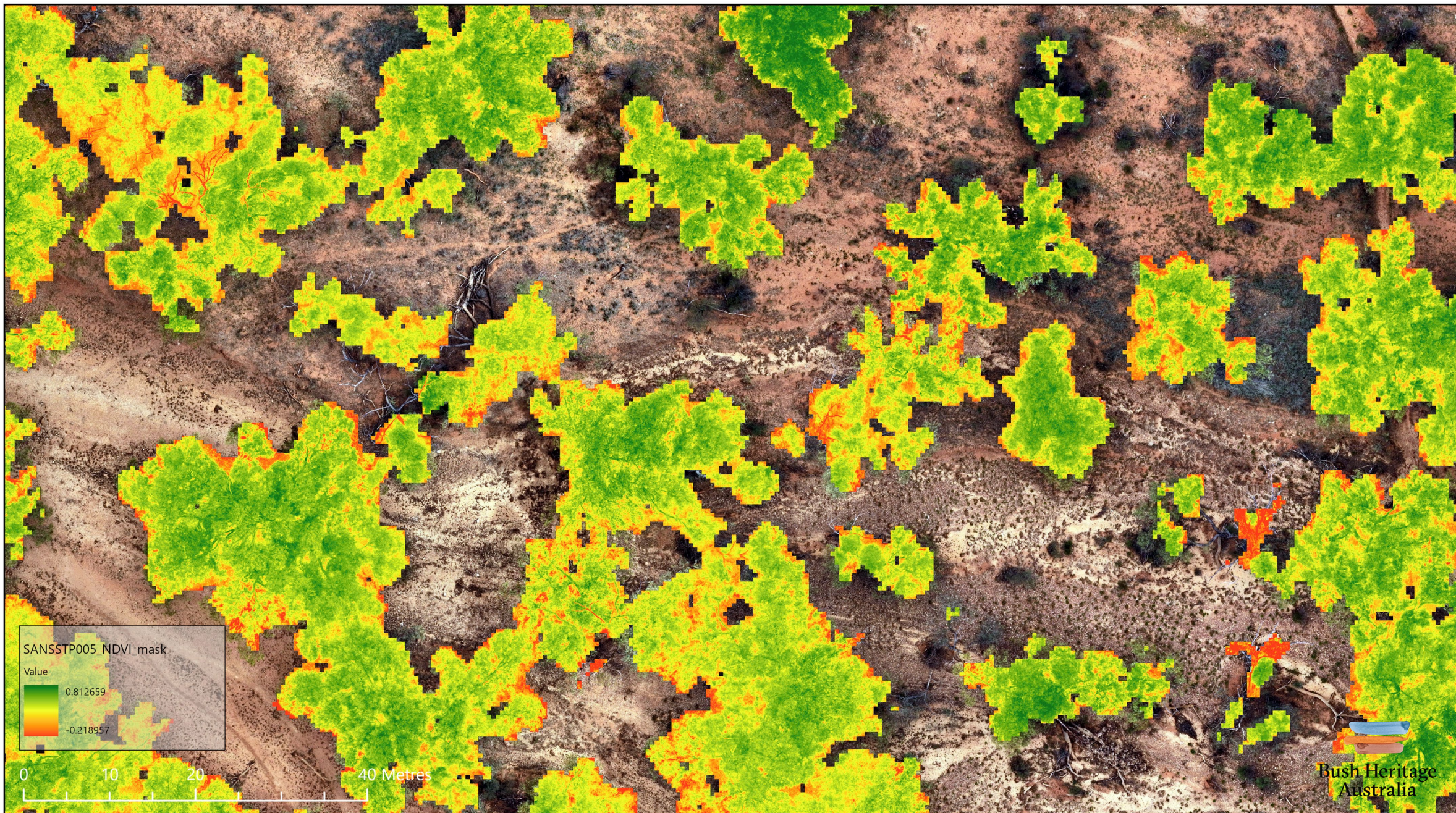


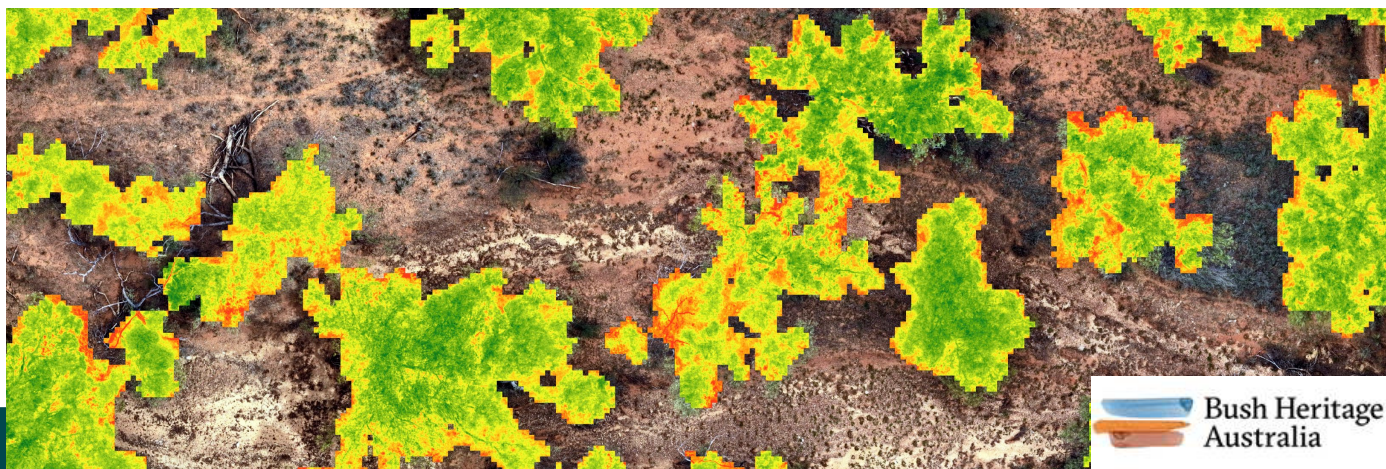
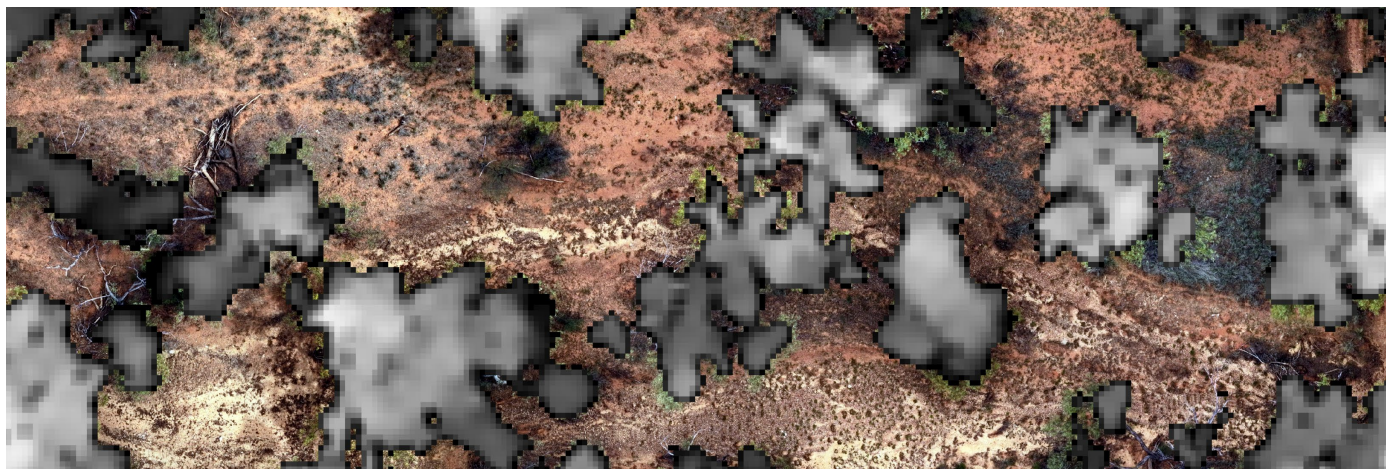
SfM point cloud – normalised and classified to derive canopy height model



SfM point cloud – normalised elevation for structural variability

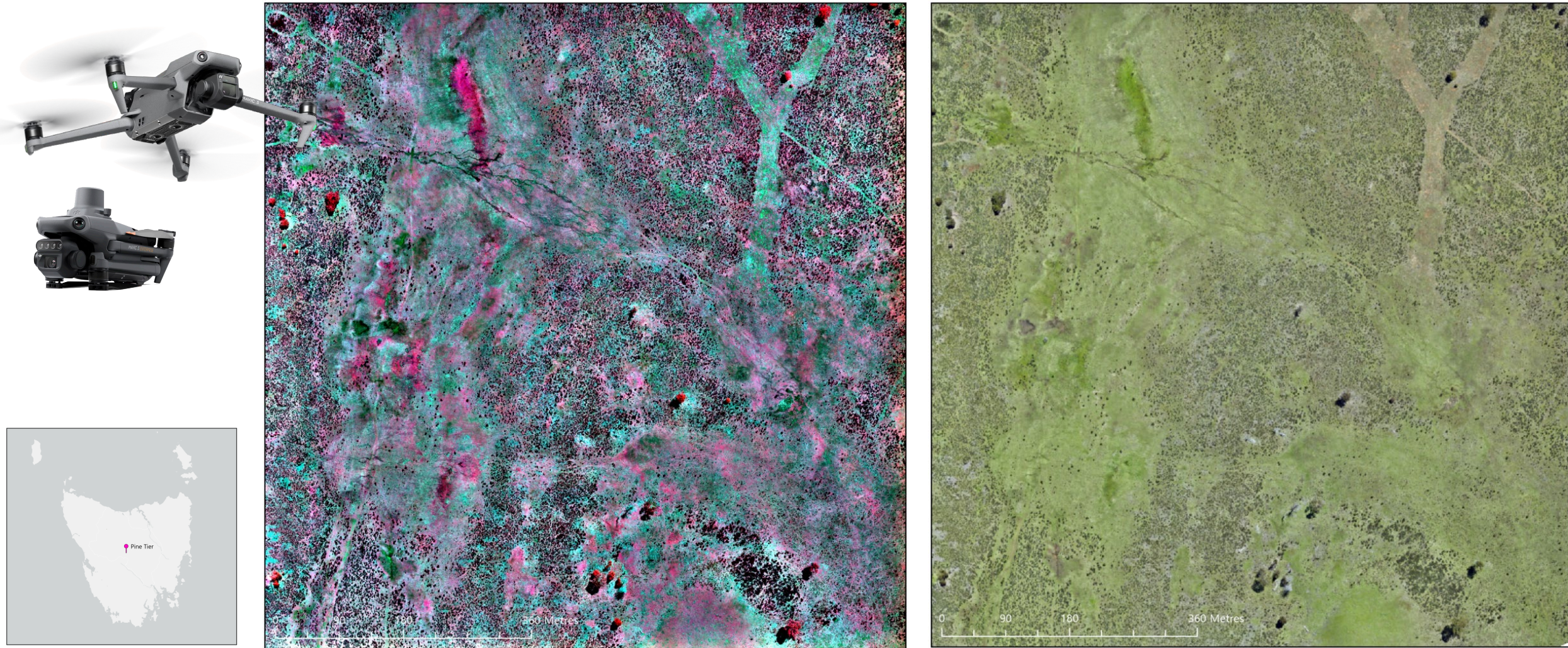






Pine Tier

Monitoring shrub encroachment into grasslands



Sloping Main Reserve

Mapping saltmarsh hydrological restoration

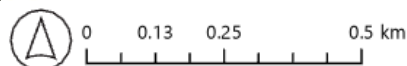
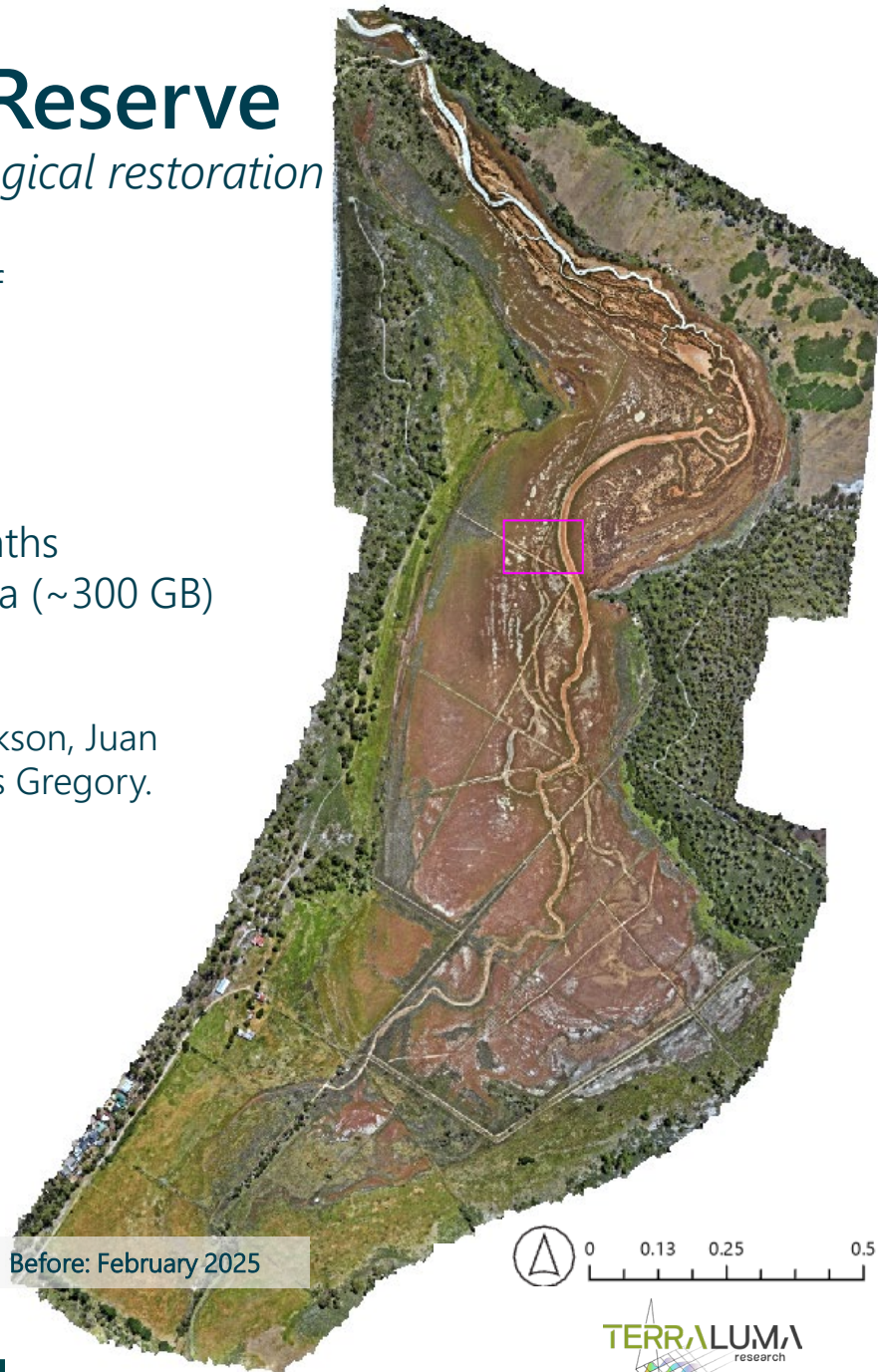
- Landscape level change of management works
- Logistically challenging
 - Covers 160 hectares
 - 3 hours of flying
 - Overlapping flight paths
 - Huge quantity of data (~300 GB)

A team effort!

Thanks to Ryan Haynes, Peter Jackson, Juan Carlos Montes-Herrera and James Gregory.



Before: February 2025



After: May 2025



Sloping Main Reserve

Mapping saltmarsh hydrological restoration





Naturescan Explorer

Beta

Remote Sensing and AI-Powered Drone Solutions for Advanced Biodiversity Monitoring



Select a collection below

- [NTAFIN](#)
- [TCNSTCH](#)
- [SANSSTP](#)
- [SAAGAW](#)



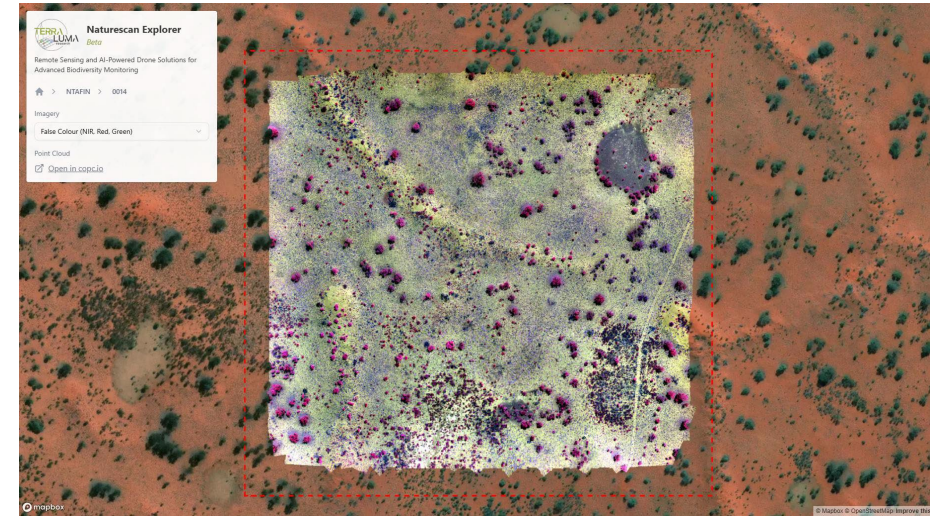
Credit: James Gregory

Four types of producers & users

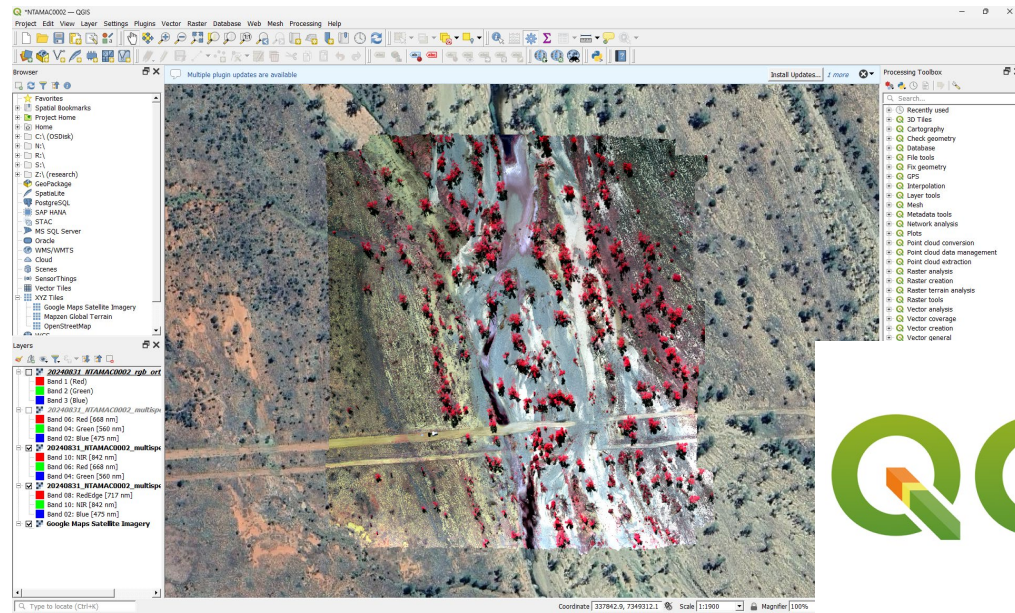
1. Data collector



2. Web viewer



3. GIS user



4. Data analytics – workflow developer



Scale	Structural diversity	Compositional diversity	Functional diversity
Sub-individual	Coarse woody debris 🍃 Standing dead 🍃	Leaf vs wood Photosynthetic vs non-photosynthetic	Ground cover (soil crust) 🍃
Individual	Coarse woody debris 🍃 Growth form 🍃 Standing dead 🍃 Vegetation volume	Broad taxonomic groups 🍃 Native vs non-native 🍃	Health 🍃 Recruitment and mortality 🍃 Vegetation indices
Sub-community	Canopy cover 🍃 Canopy height Coarse woody debris 🍃 Growth form abundance 🍃 Standing dead 🍃 Vegetation volume Vertical variability	Functional group variability Native vs non-native (relative abundance) 🍃 Population Density Spectral diversity Structural variability 🍃	Canopy cover 🍃 Fractional Photosynthetic cover 🍃 Native vs non-native (relative abundance) 🍃 Phenological change 🍃 Vegetation indices
Community / Plot scale (1 ha) (vegetation type that is consistent and homogeneous)	Canopy cover 🍃 Canopy height Coarse woody debris 🍃 Growth form abundance 🍃 Vegetation volume Vertical variability	Fractional Vegetation Cover Functional group variability Population Density Spectral diversity Structural variability 🍃	Canopy cover 🍃 Fractional Photosynthetic cover 🍃 Native vs non-native (relative abundance) 🍃 Phenological change 🍃 Vegetation indices

Essential Biodiversity Variables and Validation with Field Data

🍃 Remote sensing product that can be validated by field observations



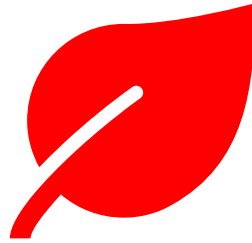
Trait mapping

Chlorophyll a+b



Chlorophylls are the primary photosynthetic pigments that absorb blue and red light, giving leaves their dominant green colour.

Anthocyanins



Anthocyanins (red–purple) act mainly in stress protection and light screening

Carotenoids



Carotenoids (yellow–orange) assist in light harvesting and photoprotection.

Becomes more visible as chlorophyll declines

Trait mapping

	Reference	Vegetation Index	Original formula	M3M formula	Equation	
Chlorophyll a+b	Marques, P.; Pádua, L.; Sousa, J.J.; Fernandes-Silva, A. Assessing the Water Status and Leaf Pigment Content of Olive Trees: Evaluating the Potential and Feasibility of Unmanned Aerial Vehicle Multispectral and Thermal Data for Estimation Purposes. <i>Remote Sens.</i> 2023, 15, 4777. https://doi.org/10.3390/rs15194777	Triangular Vegetation index (TVI)	$(120(R_{750}-R_{550})-200(R_{670}-R_{550}))/2$	$(120(R_{730}-R_{560})-200(R_{650}-R_{560}))/2$	$306.84e^{0.2077(TVI)}$	
Anthocyanin	Gitelson, A., & Solovchenko, A. (2017). Generic algorithms for estimating foliar pigment content. <i>Geophysical Research Letters</i> , 44(18), 9293-9298.	Modified Anthocyanin Reflectance Index (mARI)	$NIR((1/R_{550})-(1/R_{700}))$	$R_{860} \times ((1/R_{560}) - (1/R_{730}))$	$1.878 * mARI - 0.211$	
Carotenoid	Datt, B. (1998). Remote sensing of chlorophyll a, chlorophyll b, chlorophyll a + b, and total carotenoid content in eucalyptus leaves. <i>Remote sensing of environment</i> , 66(2), 111-121.	Datt index	$(R_{860}/(R_{550} \times R_{708}))$	$R_{860} / (R_{560} \times R_{730})$	$0.003(Datt\ index)^{1.2395}$	



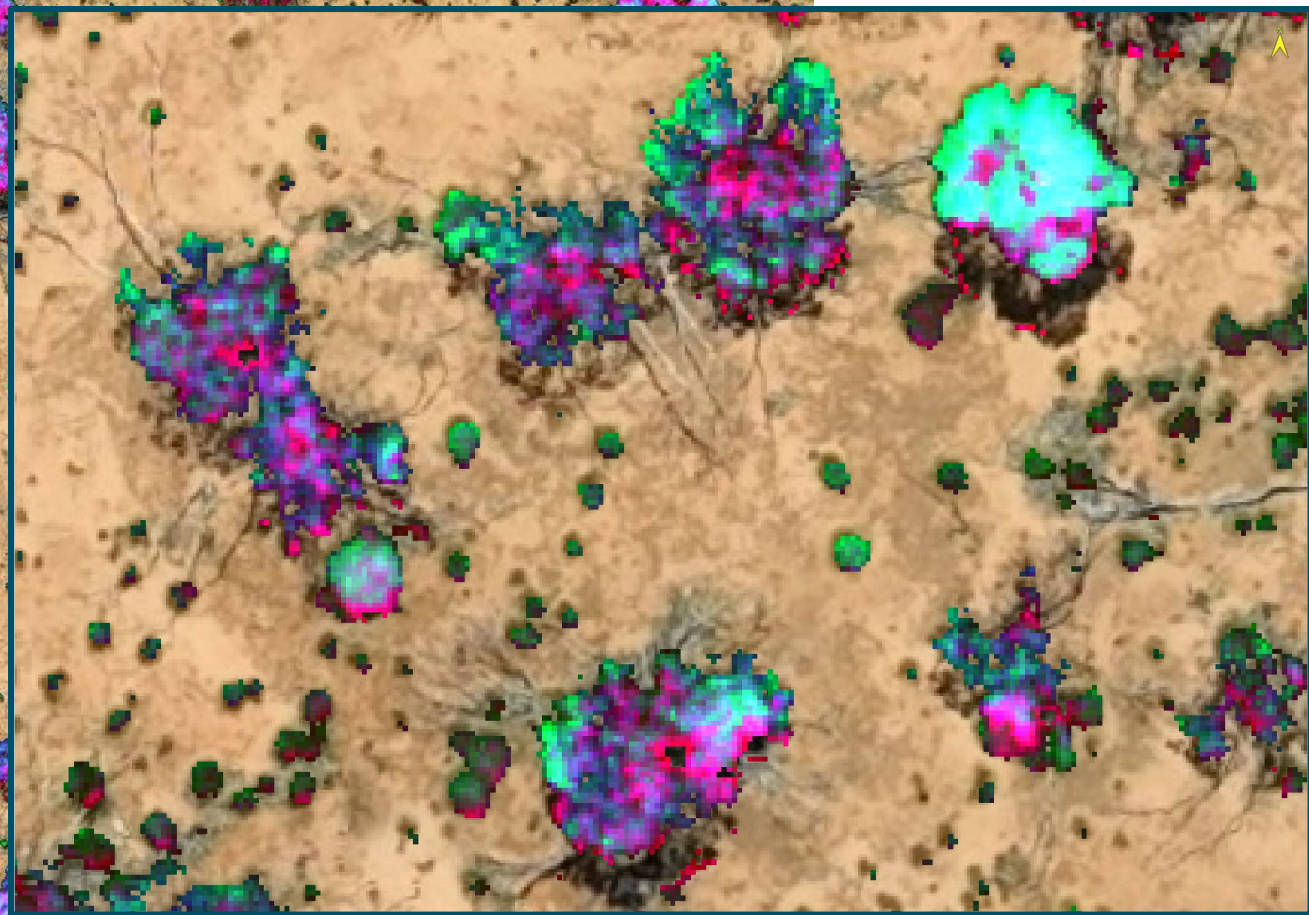
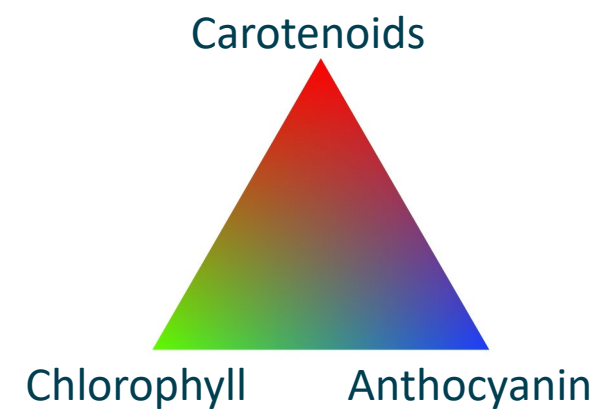
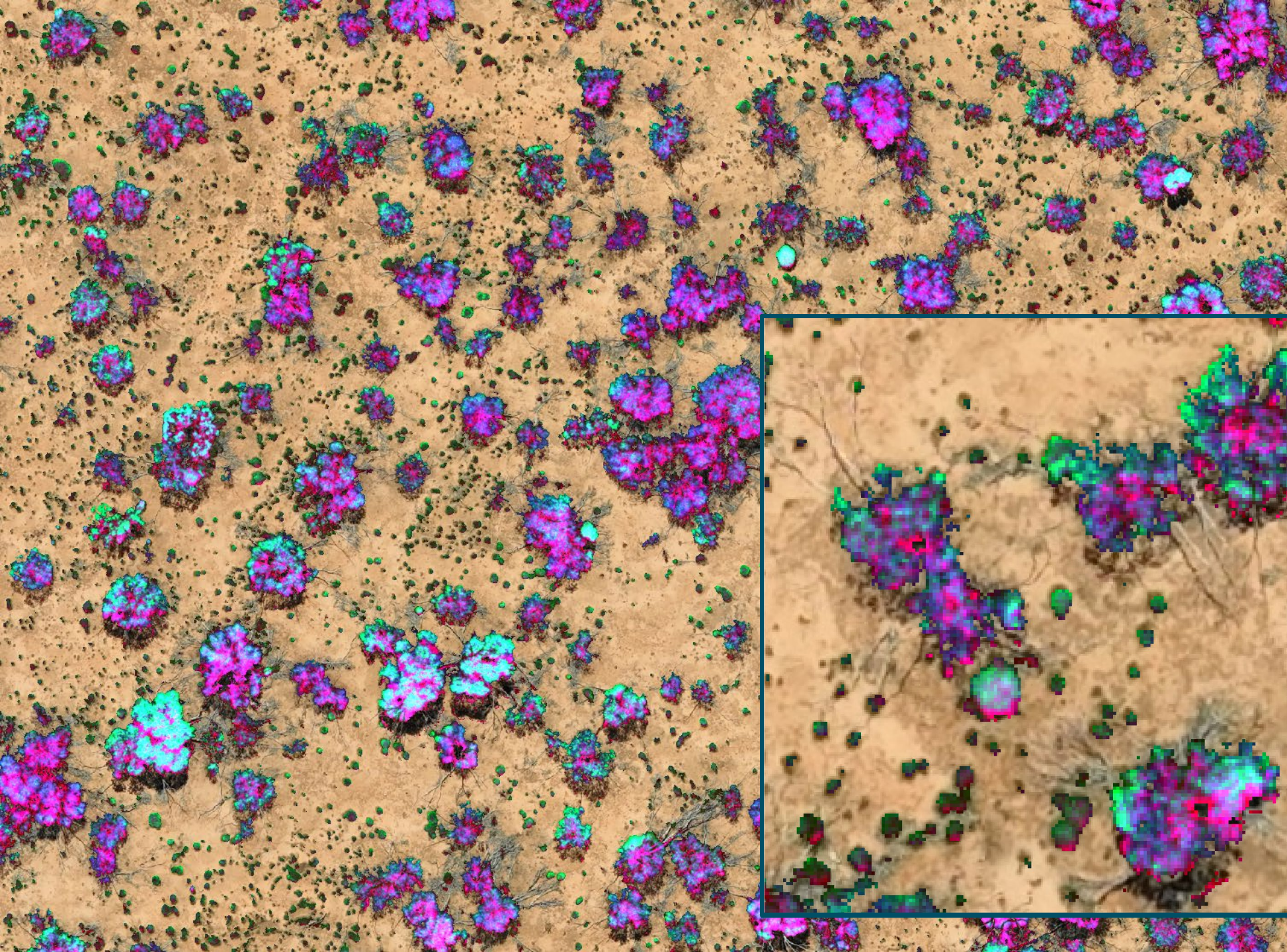
M3M bands:

Green (G): 560 ± 16 nm;

Red (R): 650 ± 16 nm;

Red Edge (RE): 730 ± 16 nm;

Near infrared (NIR): 860 ± 26 nm;





Conclusion

- NatureScan aims to lower the knowledge barrier of drones for ecological monitoring through developing user-friendly and robust protocols.
- Processing of drone data for analysis-ready products that are validated with field data and accurately represent ecosystem structure, function and composition.



Next steps

- Continue and expand partnerships with conservation organisations, private landholders and Indigenous Australians.
- Collect drone data nationally across diverse ecosystems
- Develop web-based data interface for visualisation and analysis.



Publicly available project outputs

- Raw and processed drone datasets.
- Drone collection and processing protocols.
- Analysis workflows to derive biodiversity variables.



Australian Government
Department of Climate Change, Energy,
the Environment and Water

NatureScan is funded through a DCCEEW Innovative Biodiversity Monitoring grant

Thank you to our project partners



TASMANIAN
LAND
CONSERVANCY



Bush Heritage
Australia



Drone data collection protocol



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M350 Protocols

DroneScape Multispectral and RGB Protocols

DroneScape Lidar Protocols

DroneScape Data

TDDP

Mavic 3M Protocols

NatureScan Protocols

NatureScan Explorer

Field Sensors and Platforms

Randall

1:30 -3pm

Inc. 30 mins for Ben Re Dronescape (and drones generically)



How we use Cal/Val data

Some examples

Randall

3:30 – 5pm



What to expect in the field

Ben (Just before 5pm)





Practical

What is in store for the rest of the week?

TERN is supported by the Australian Government through the National Collaborative Research Infrastructure Strategy and the Super Science Initiative.

The END

