EGU26
GENERAL ASSEMBLY

ecological AUSTRALIA
A TETRA TECH COMPANY

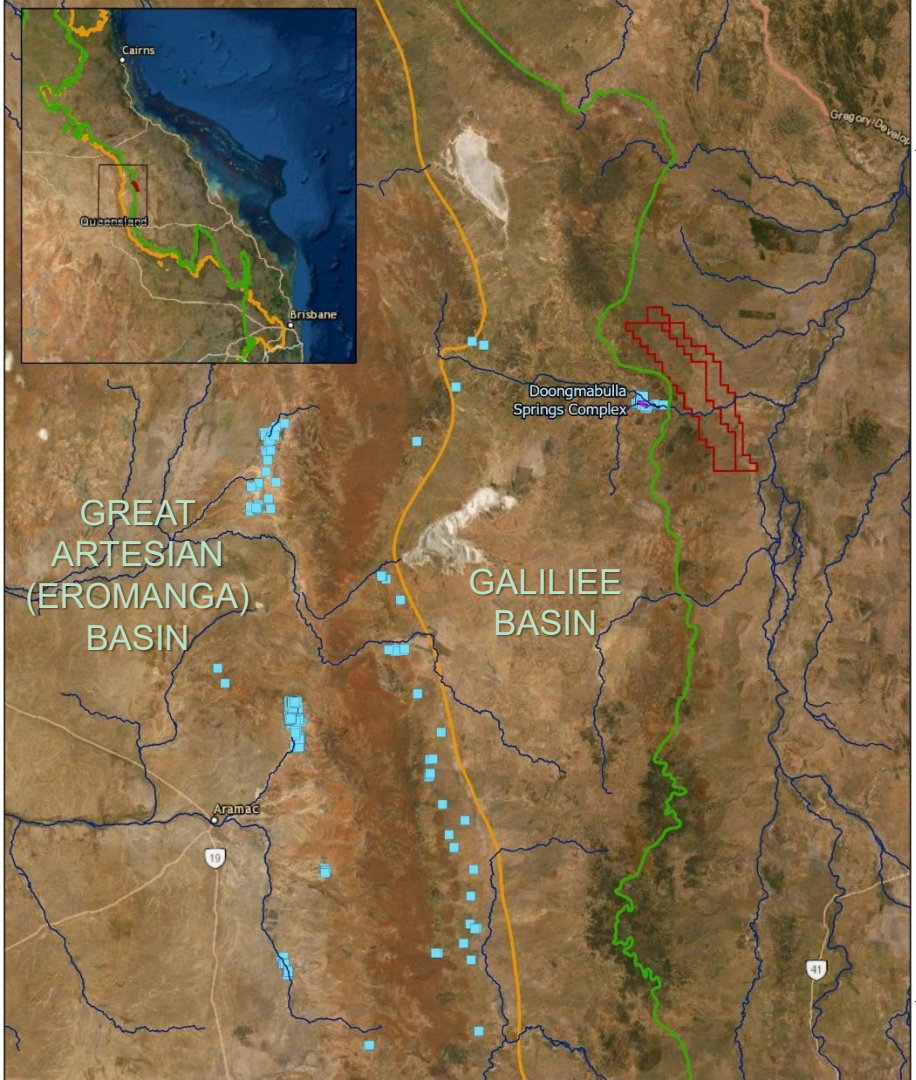
MULTIPLE LINES OF EVIDENCE PROVIDE A HOLISTIC AND TESTABLE CONCEPTUALISATION OF COMPLEX ECOSYSTEM-GROUNDWATER DYNAMICS AT THE DOONGMABULLA SPRINGS COMPLEX, QUEENSLAND, AUSTRALIA

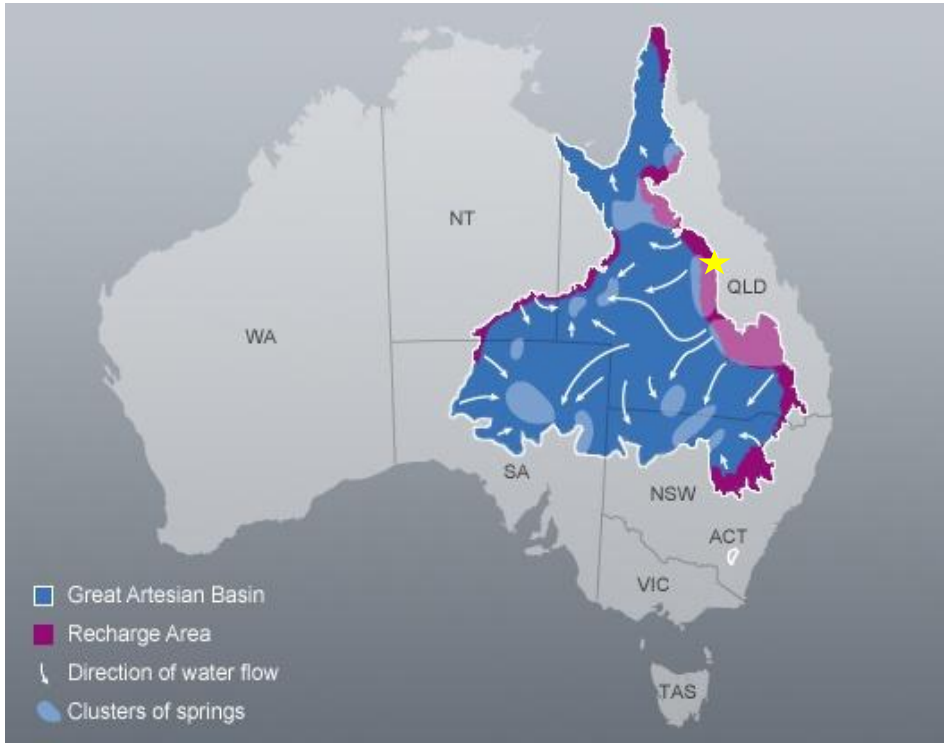
Dr **Richard Cresswell**
ELA GDE Growth Initiative Lead

with help from many others!

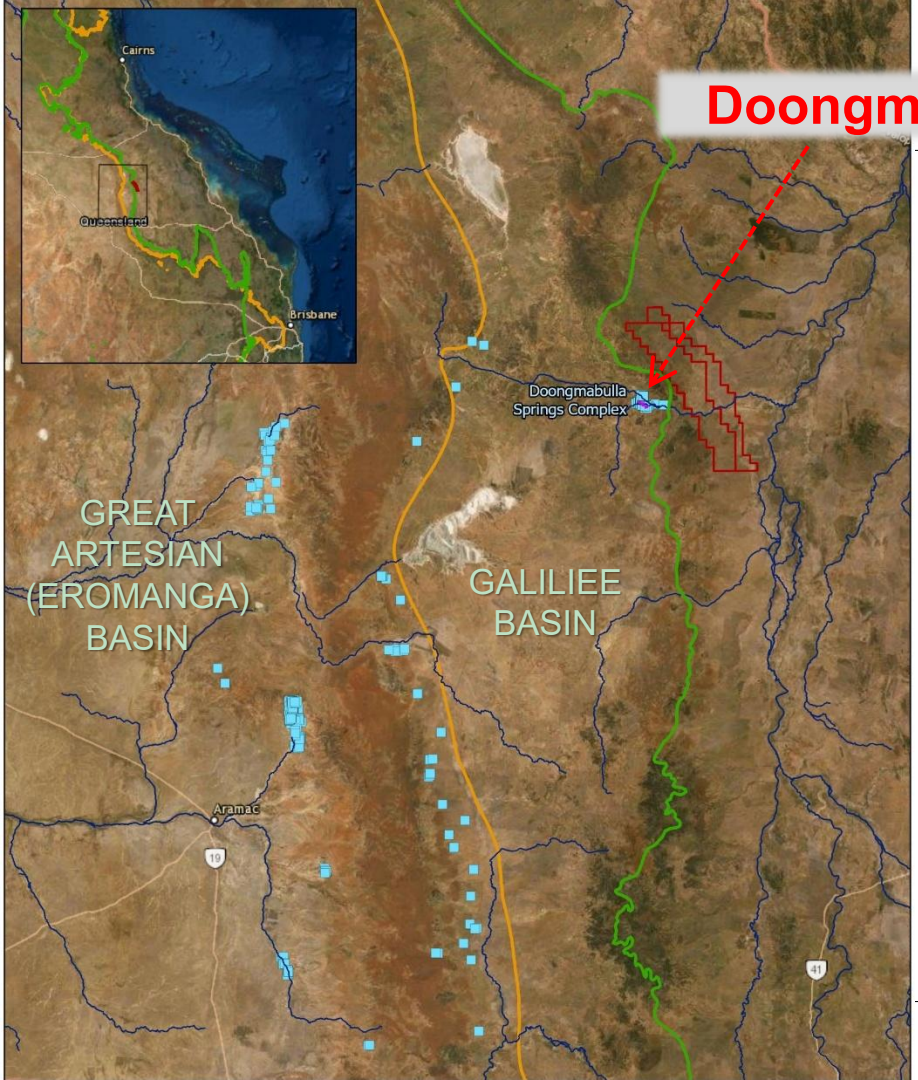
EGU26-15005

Recharge springs of NE Australia



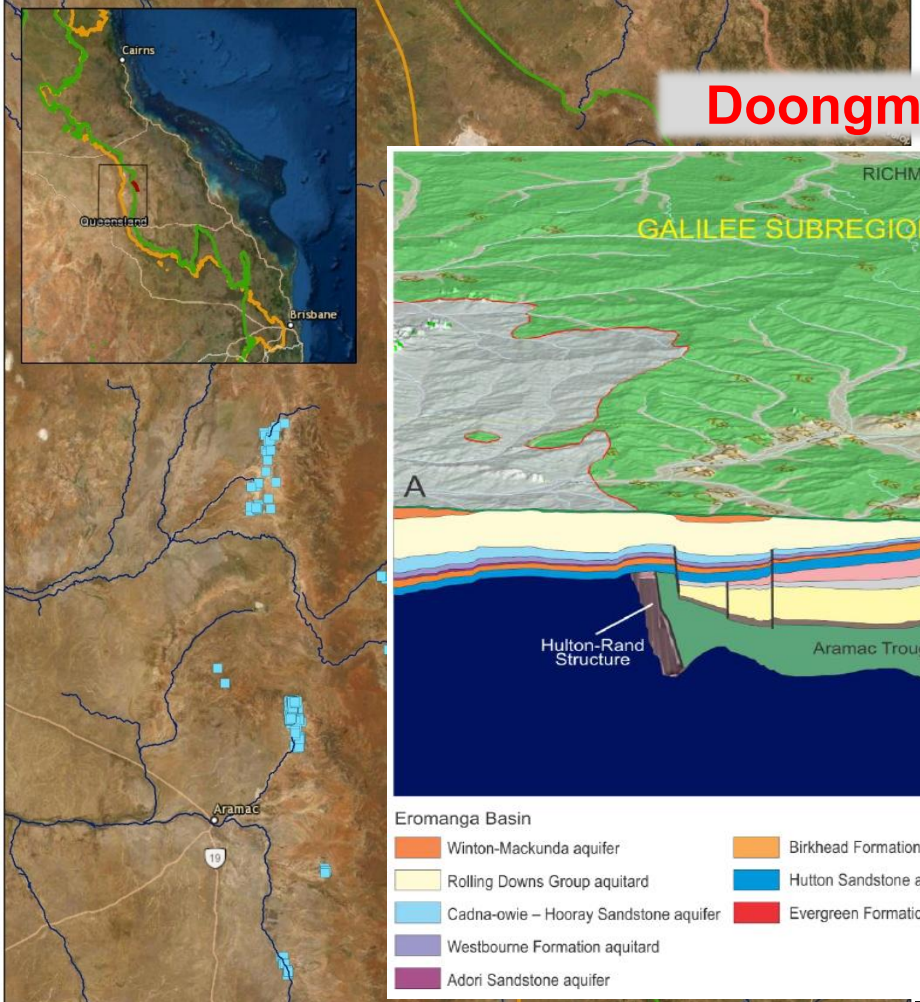


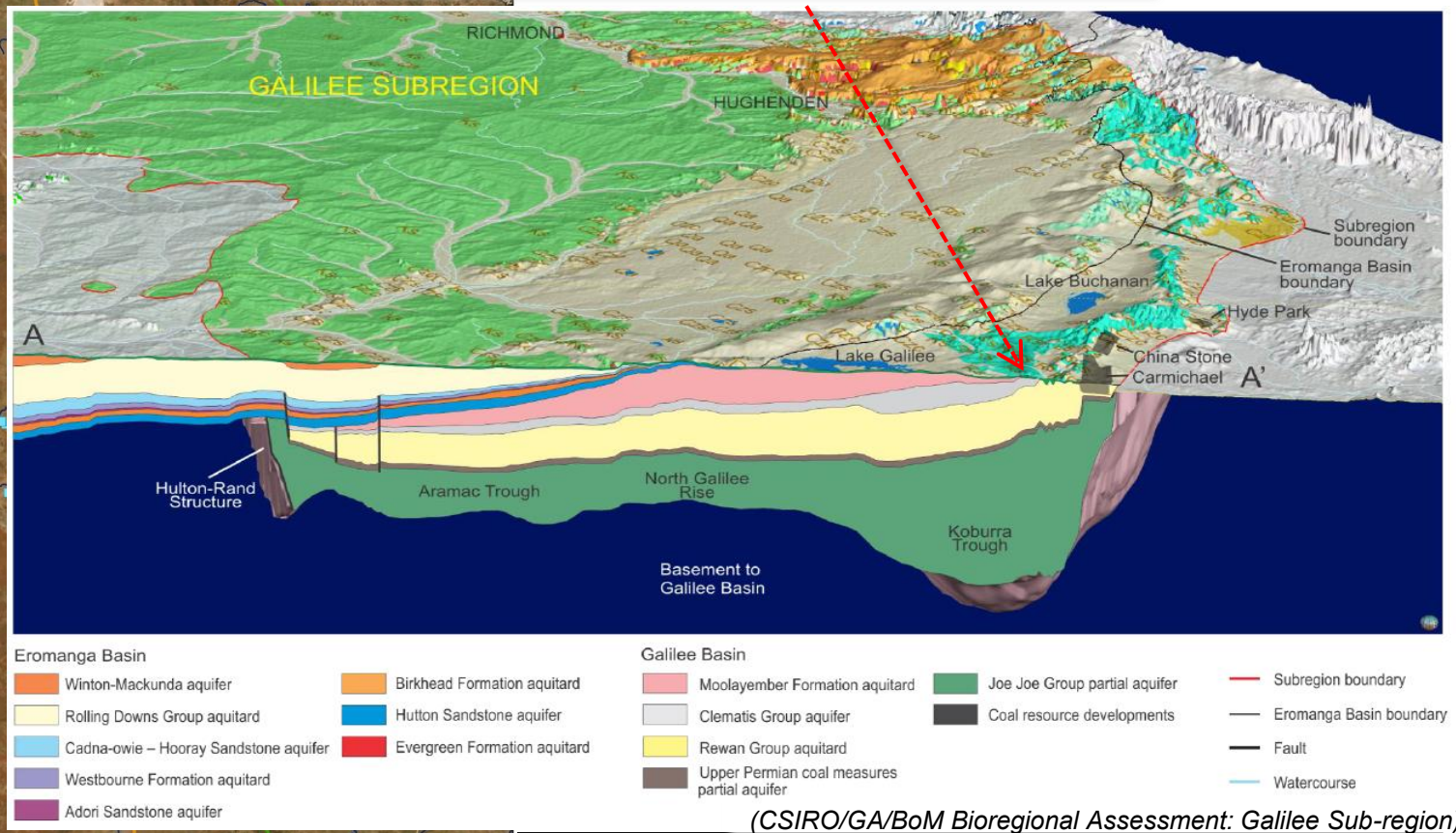
Doongmabulla Springs Complex



- 187 mapped vents – artesian groundwater discharge
- Range in size from <10cm to over 9 hectares
- 16 spring clusters
- Support unique assemblages of flora, including Threatened Ecological Communities listed under Australian National Environmental Legislation (EPBC Act 1999) as well as endemic species listed as endangered or threatened/vulnerable under both state and federal legislation
- High cultural and ecological value
- Potentially impacted by nearby mining

Doongmabulla Springs Complex



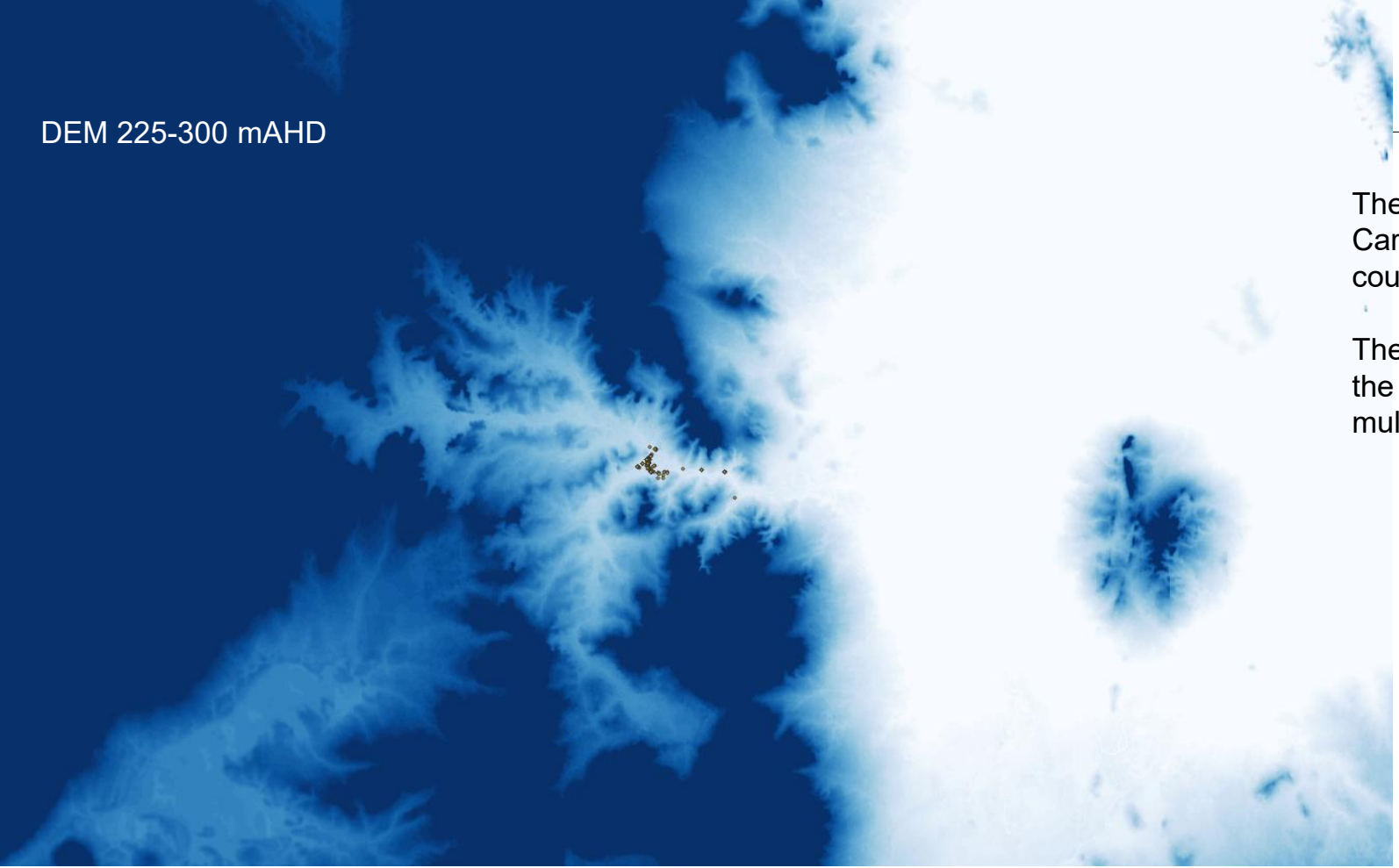


(CSIRO/GA/BoM Bioregional Assessment: Galilee Sub-region)

DEM 225-250 mAHD

The springs occur in a solitary east-flowing palaeovalley.

Similar geomorphology is not seen anywhere else along the Galilee Basin margin.



The tributaries to the Carmichael River flow counter to the geology.

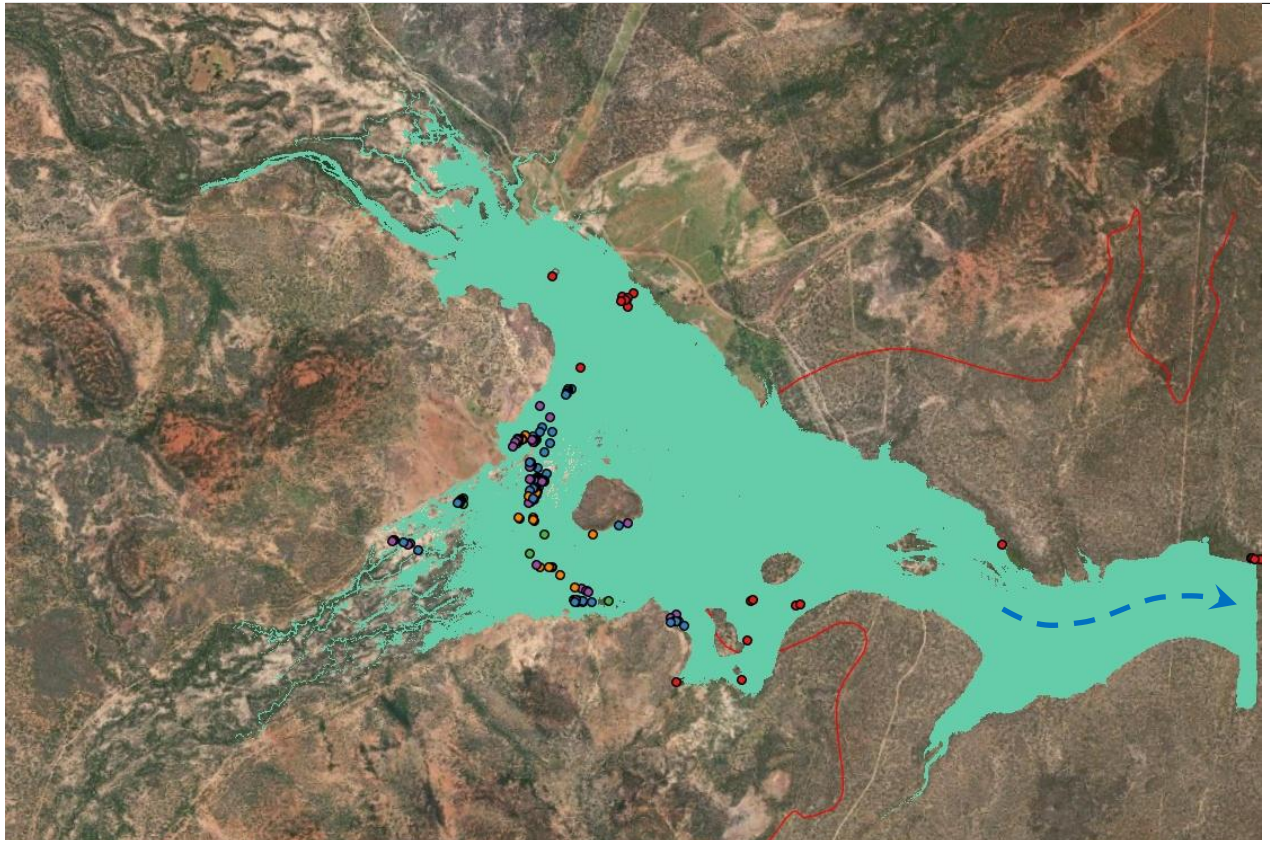
The springs occur at the confluence of multiple tributaries.

DEM 225-300 mAHD
(NB Artesian pressure ~240mAHD)

Geology controls groundwater movement:

The Moolayember Formation is an incised aquitard and springs are concentrated where the river system is focussed and cuts through the underlying Clematis Sandstone and artesian groundwater breaks the surface.

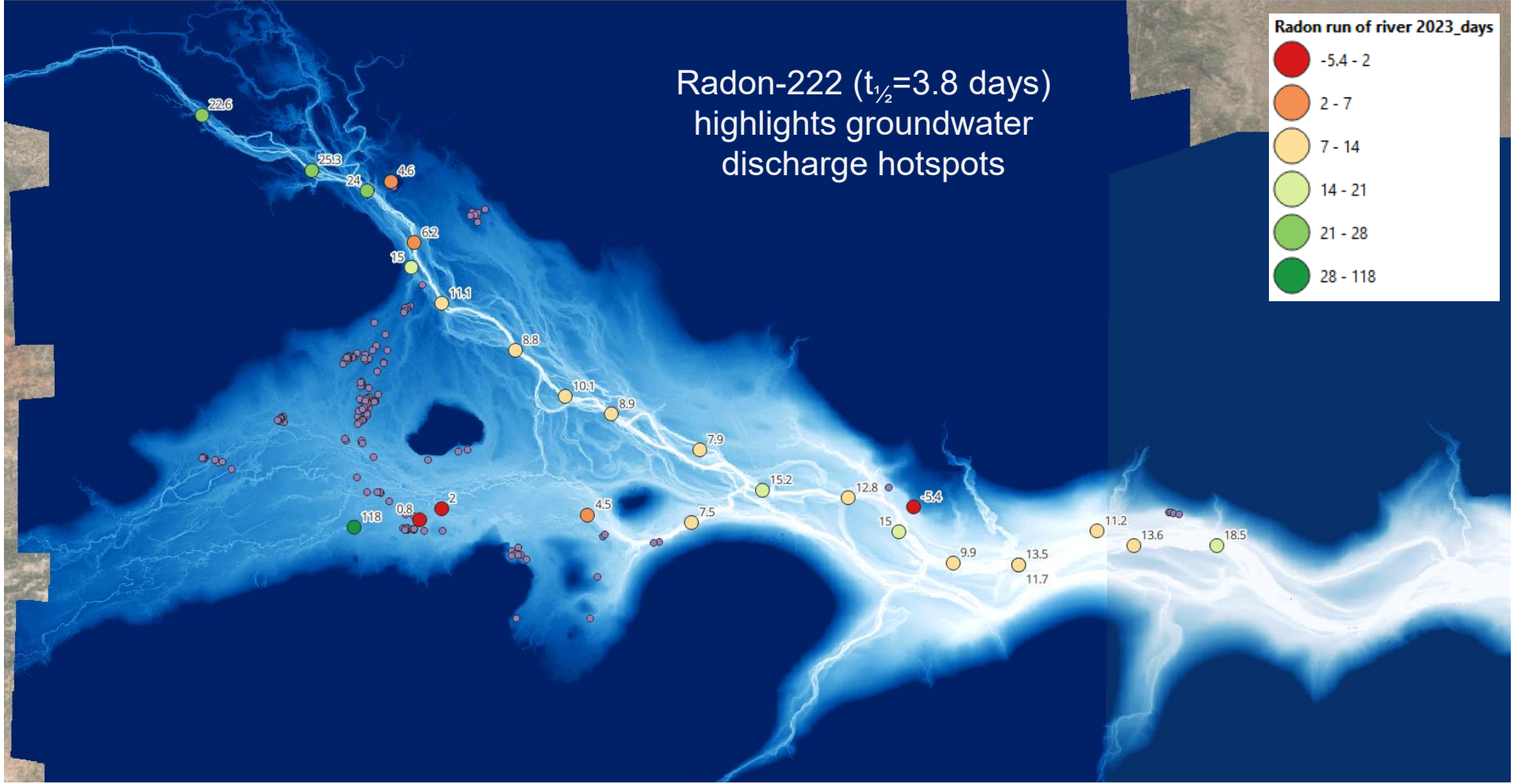
Clematis Sandstone potentiometric surface above ground surface

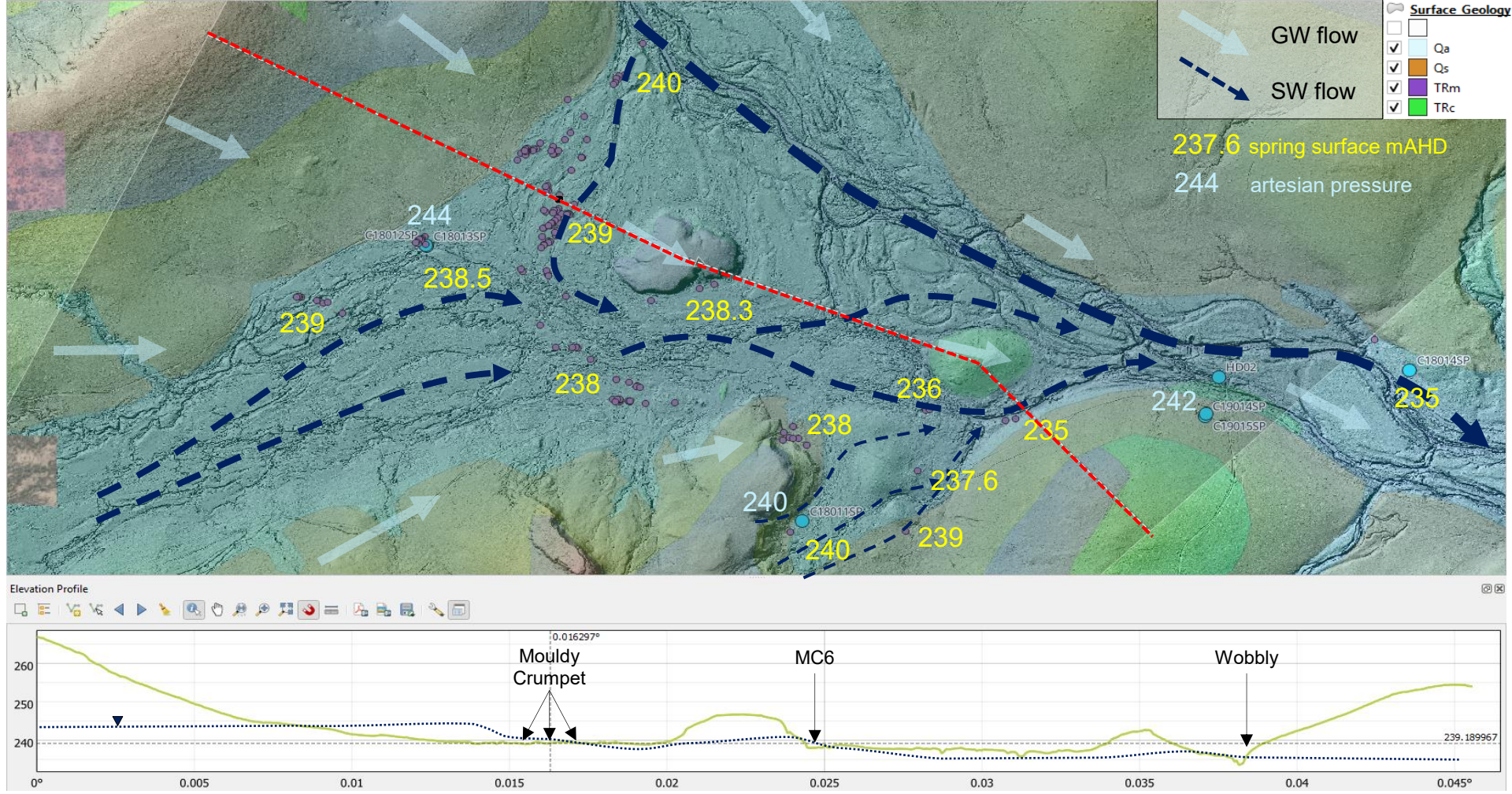


The interpolated minimum – end dry season – potentiometric head generates the springs where artesian groundwater intersects the palæovalley sediments, creating the arcuate discharge pattern.

The springs act as pressure release valves, reducing downstream heads to sub-artesian pressures except along river channels where bedrock funnels the alluvium and springs persist on the riverbanks.

The Carmichael River thus acts as a groundwater drain.


Radon-222 ($t_{1/2}$=3.8 days) highlights groundwater discharge hotspots
Radon run of river 2023_days
-5.4 - 2
2 - 7
7 - 14
14 - 21
21 - 28
28 - 118
22.6
25.3
24
4.6
6.2
15
11.1
8.8
10.1
8.9
7.9
15.2
12.8
-5.4
15
11.2
13.6
18.5
9.9
13.5
11.7
7.5
4.5
2
0.8
118


GW flow
SW flow
Surface Geology
Qa
Qs
TRm
TRc
237.6 spring surface mAHD
244 artesian pressure
240
244
C18012SP
C18013SP
239
238.5
238.3
239
238
236
235
242
HD02
C19014SP
C19015SP
C18014SP
235
238
237.6
240
C18011SP
239
240
Elevation Profile
0.016297°
Mouldy Crumpet
MC6
Wobbly
260
250
240
239.189967
0°
0.005
0.01
0.015
0.02
0.025
0.03
0.035
0.04
0.045°

Major watercourses

Spring clusters

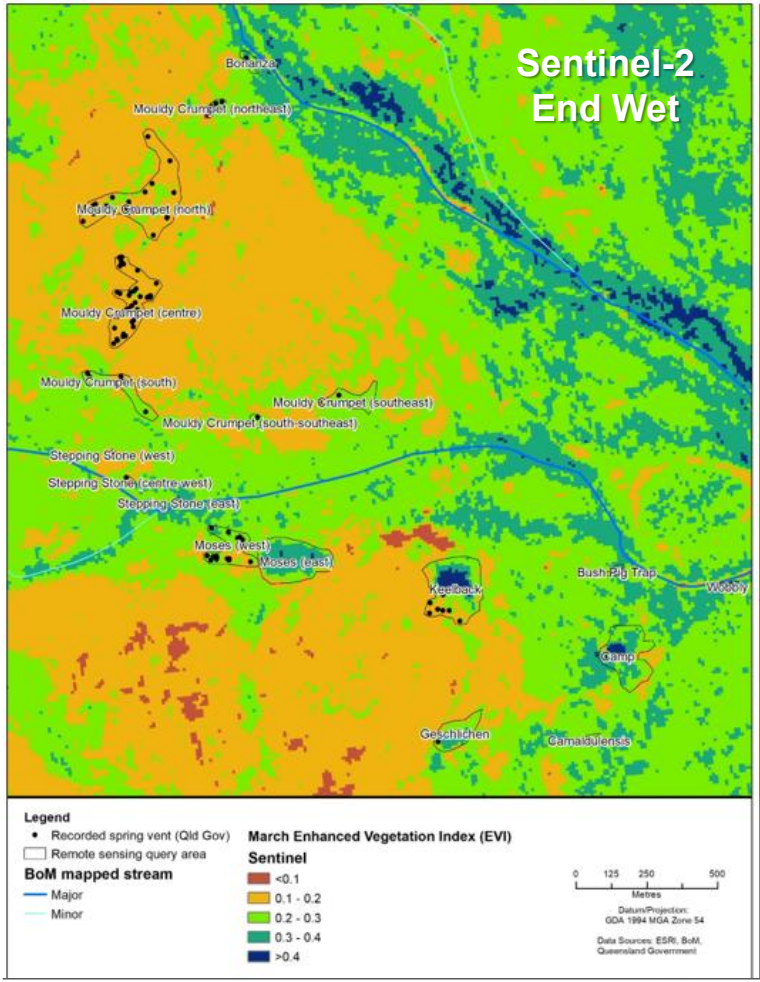
- Bonanza
- Bush Pig Trap
- Camaldulensis
- Camp
- Dusk
- Geschlichen
- House
- Joshua
- Keelback/Little Keelback
- Little Moses
- Moses
- Mouldy Crumpet
- Stepping Stone
- Surprise
- Wobbly/Junior Wobbly
- Yukunna Kumoo

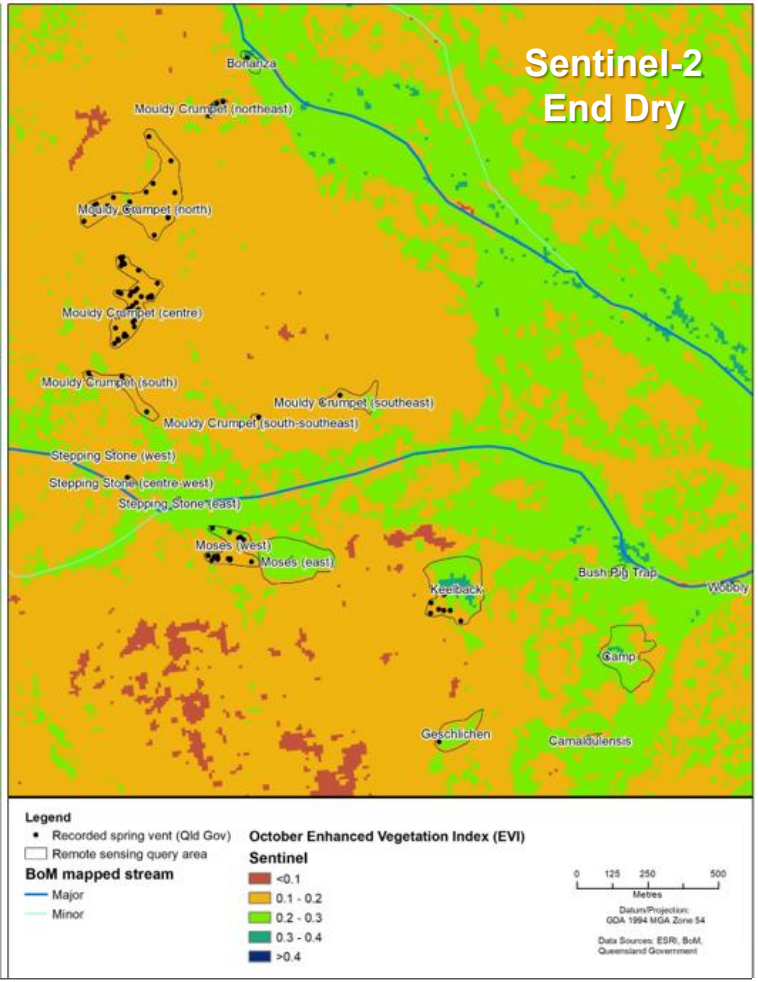
Doongmabulla Springs

0 0.4 0.8 1.6

Kilometers

There are the traditional ways of monitoring these springs…



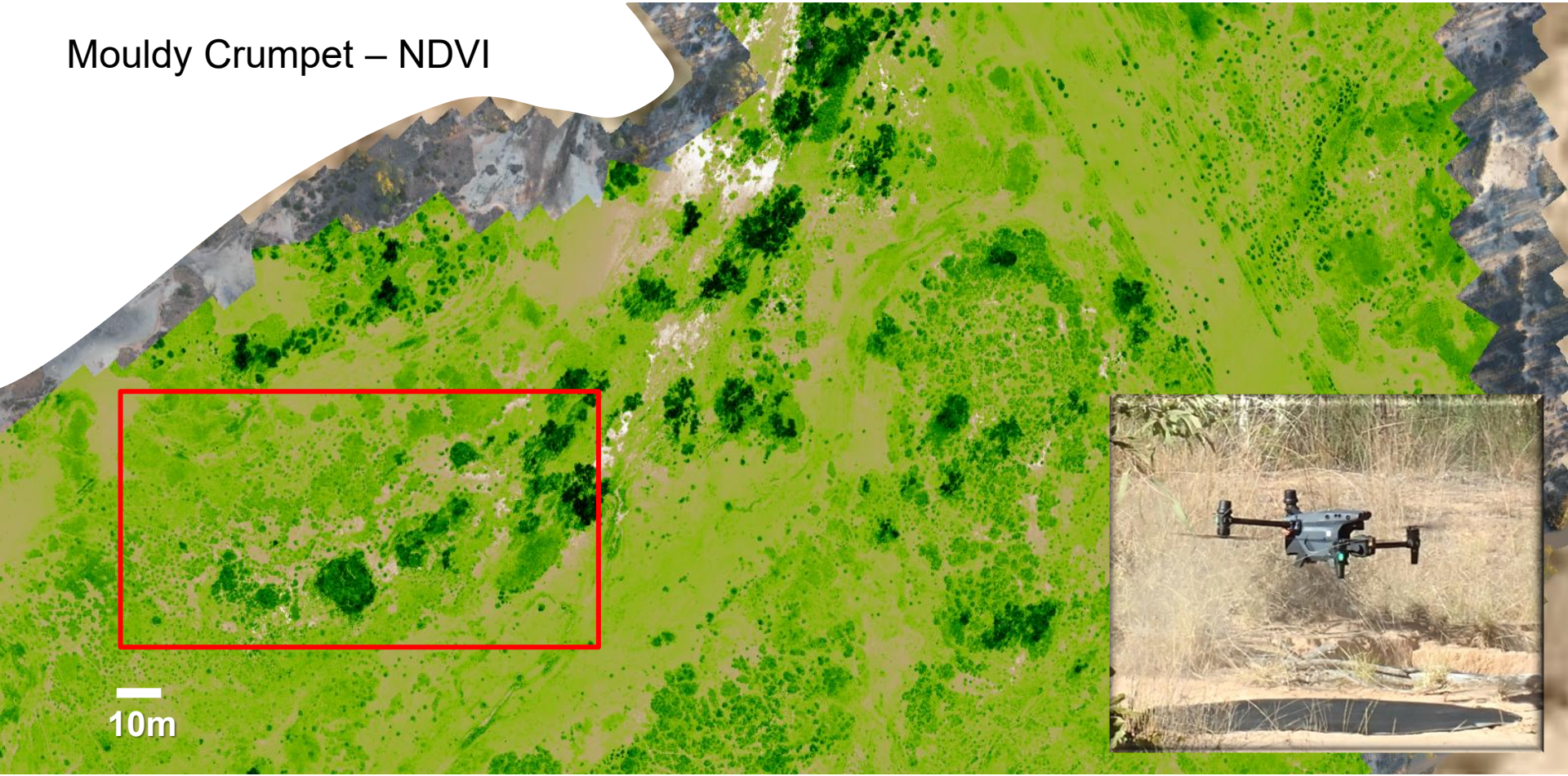


… and the new ways.

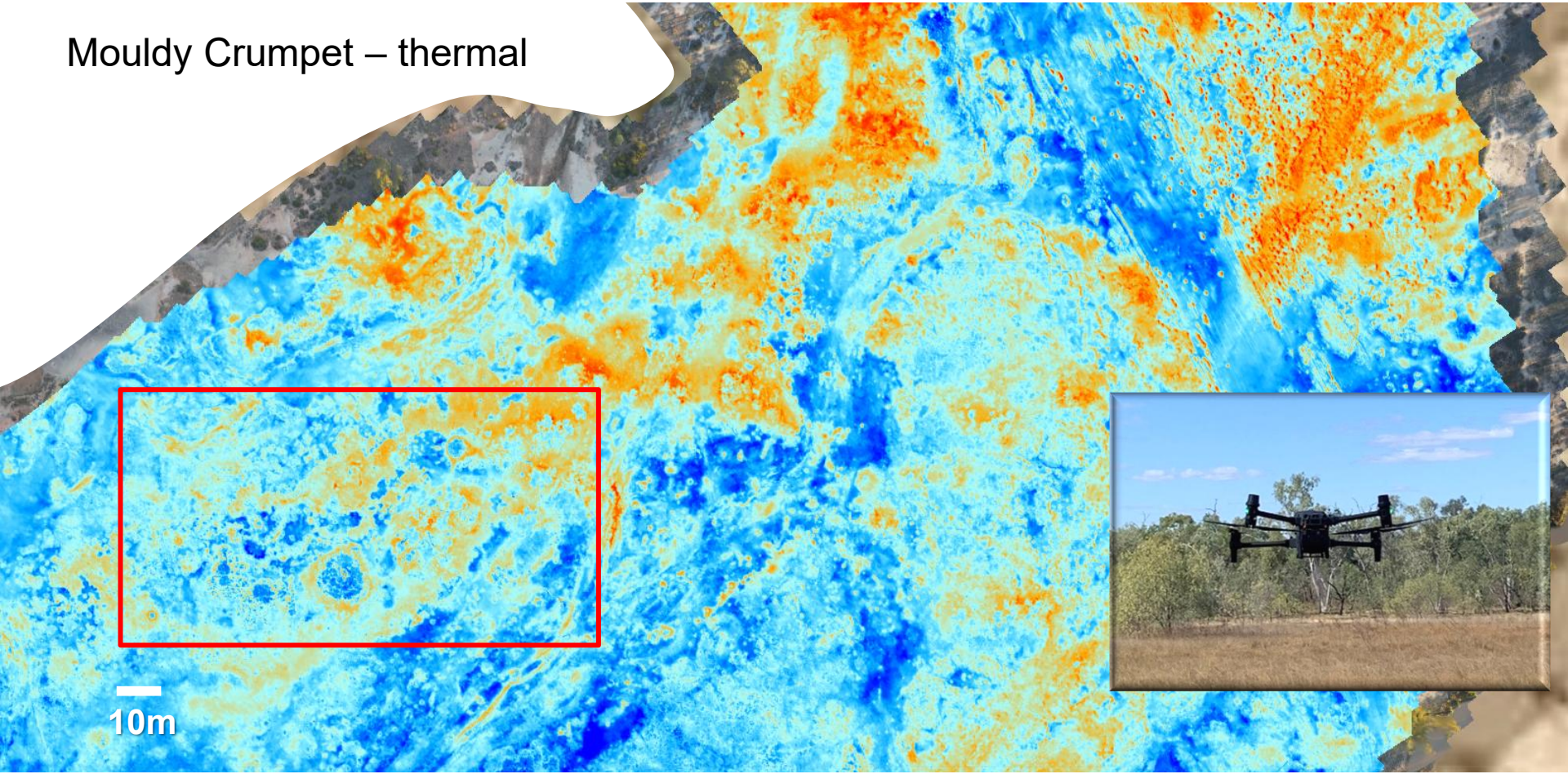
Which don't always work!

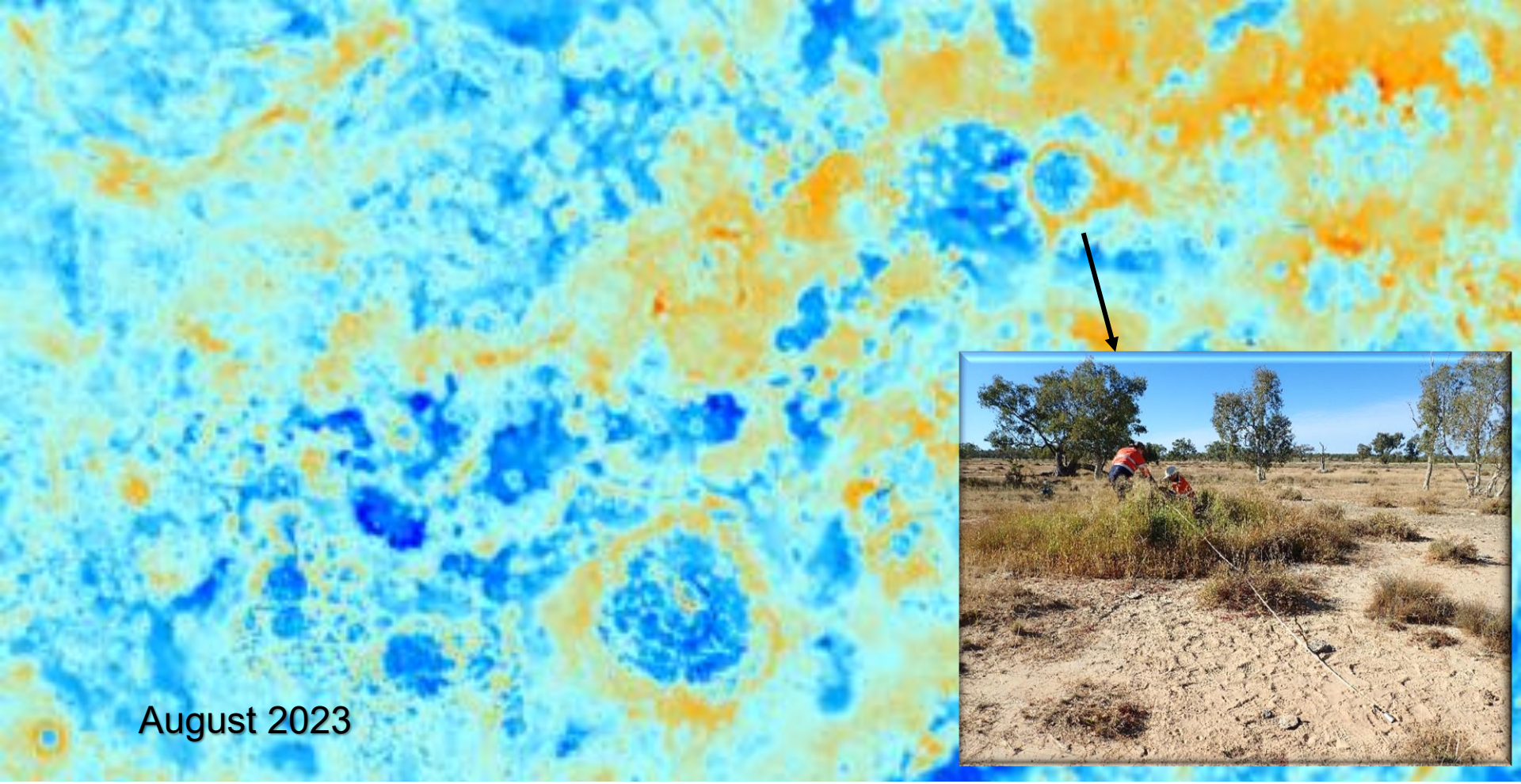
Perhaps at a finer scale?

Mouldy Crumpet – NDVI

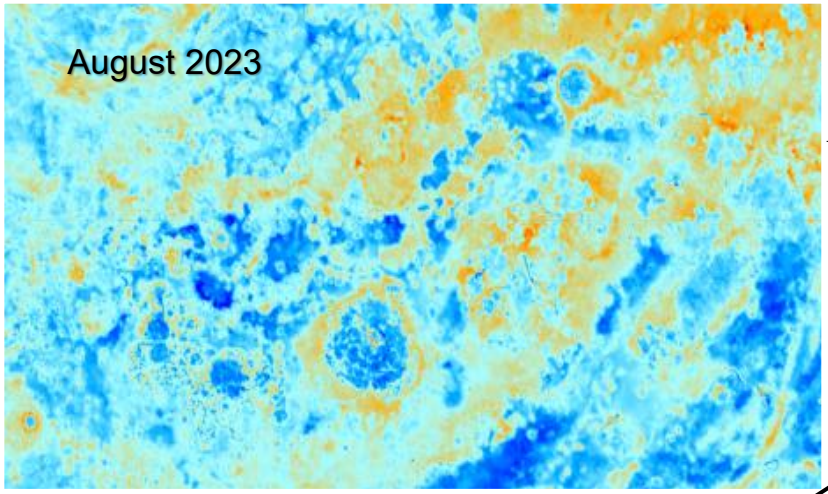


Mouldy Crumpet – thermal



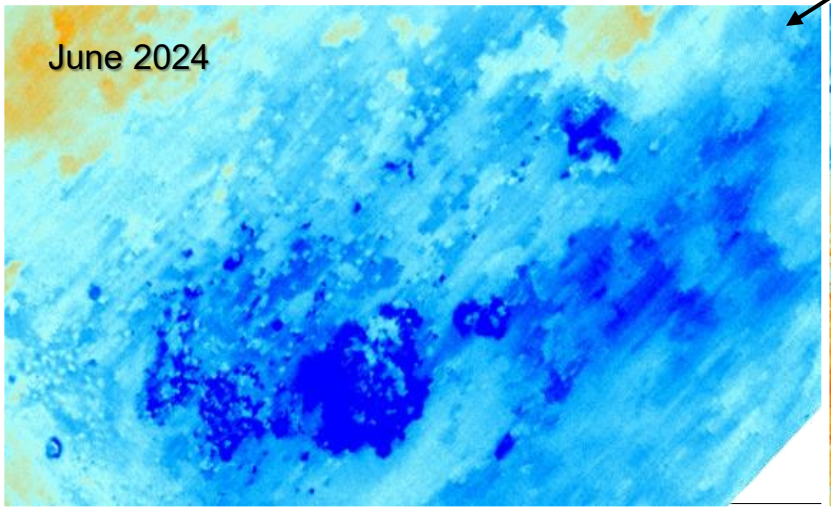

August 2023

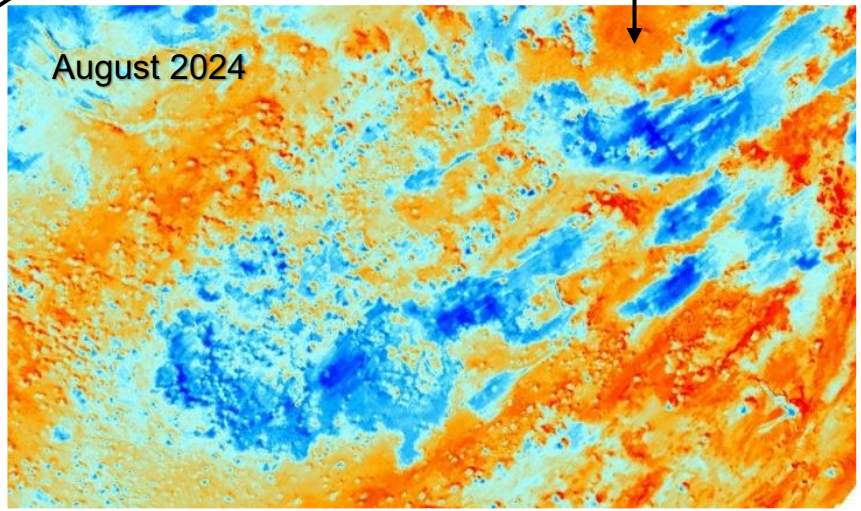
But thermal has its limitations…



Late dry season

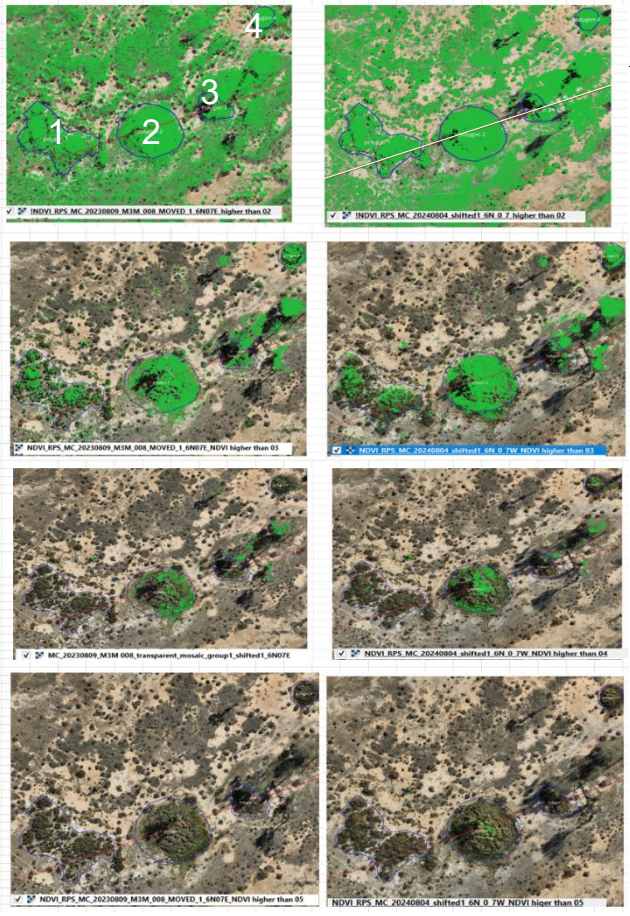
Early dry season





Using drone NDVI to monitor spring variability

August 2023 August 2024

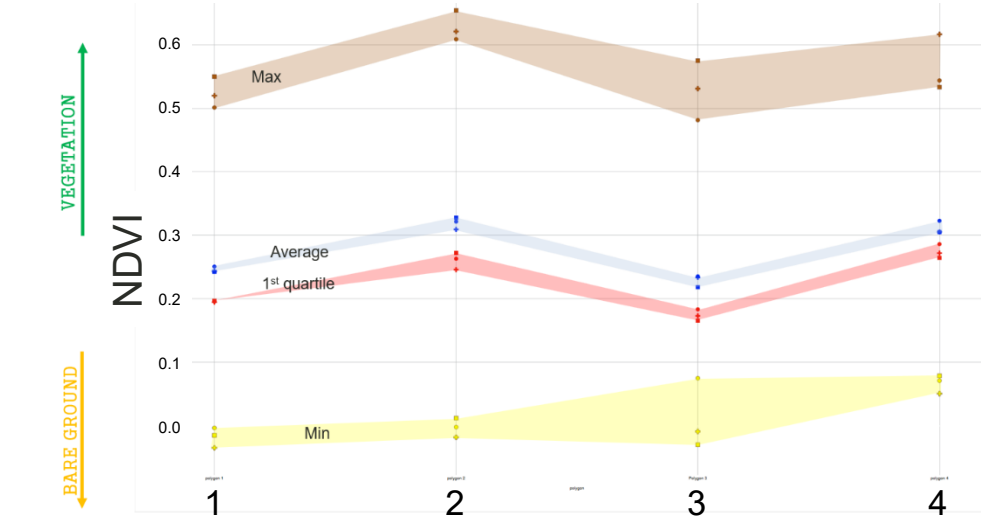


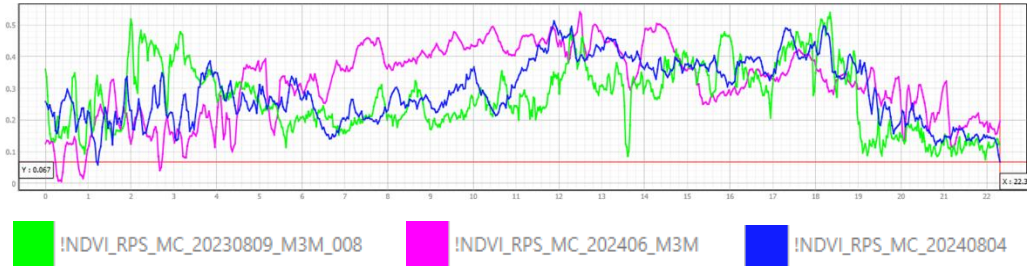
NDVI>0.2

NDVI>0.3

NDVI>0.4

NDVI>0.5





Thanks for listening and thanks to my co-authors:

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Miles Yeates

Penn Lloyd

David Stanton

Gibson et al: #8457
vPoster 2 hours ago!

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