Department of Primary Industries and Regional Development

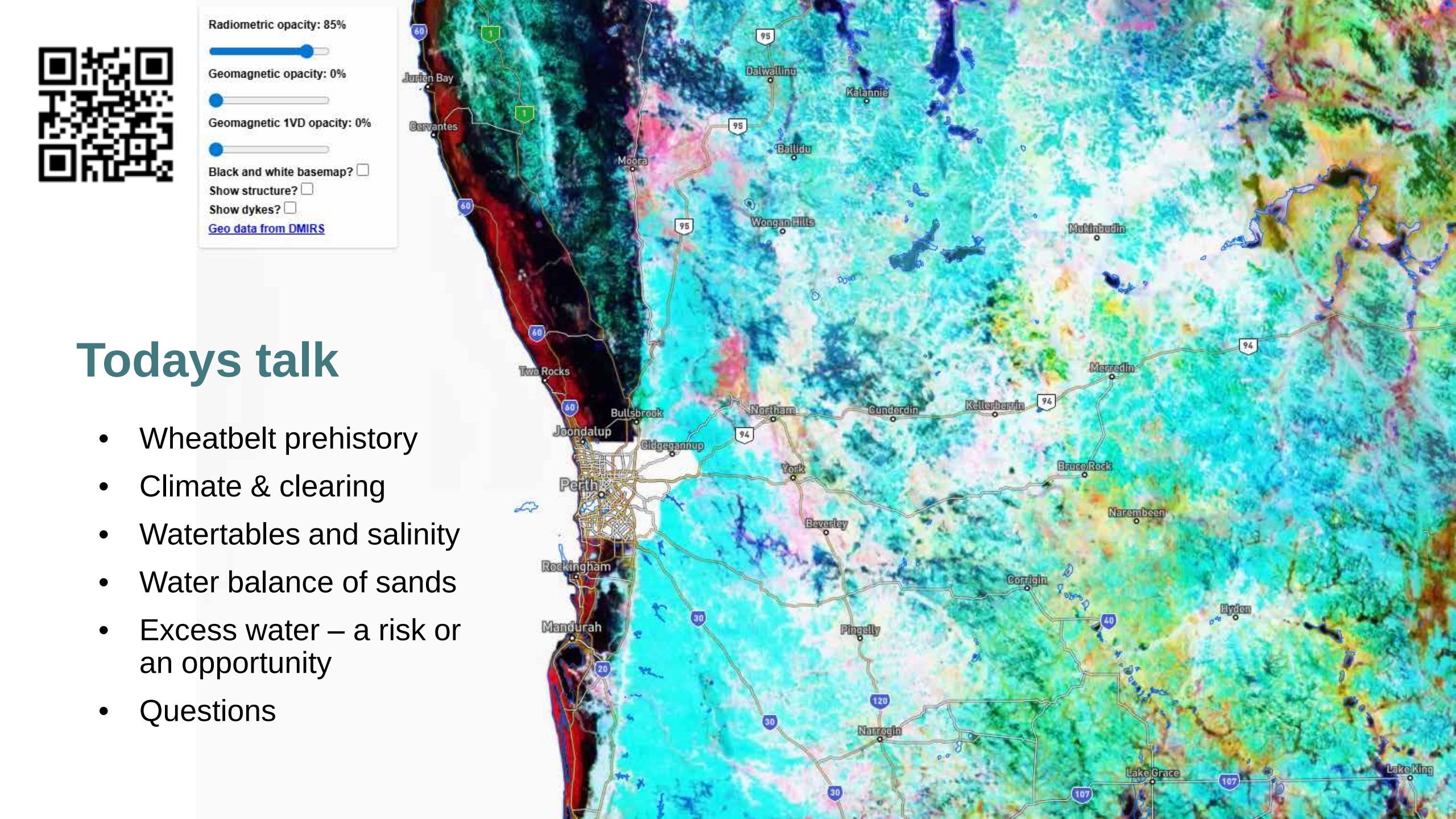
GOVERNMENT OF WESTERN AUSTRALIA

Protect
Grow
Innovate

Surface & Groundwater Hydrology Associated with Sandy (and saline) landscapes

Keynote 23/7/2025

Dr Richard George
Water Science Team

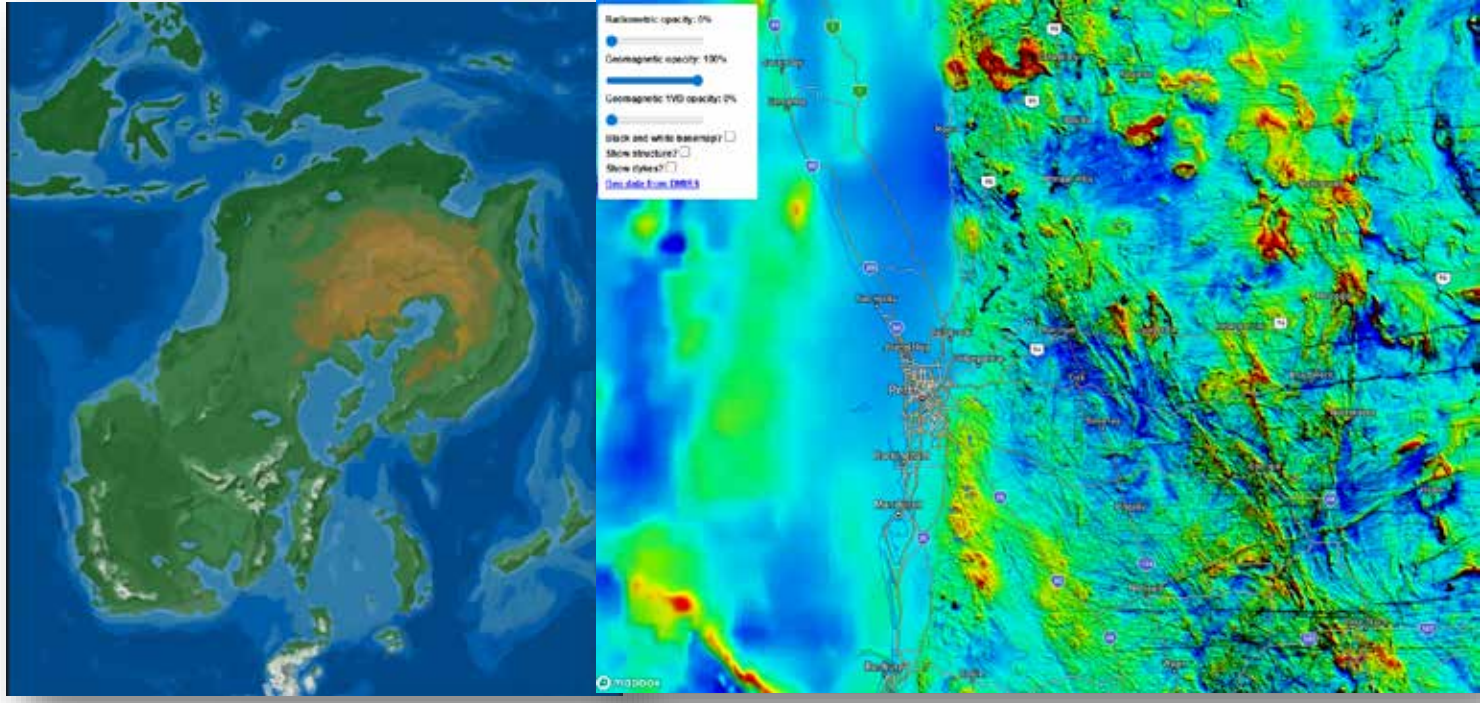


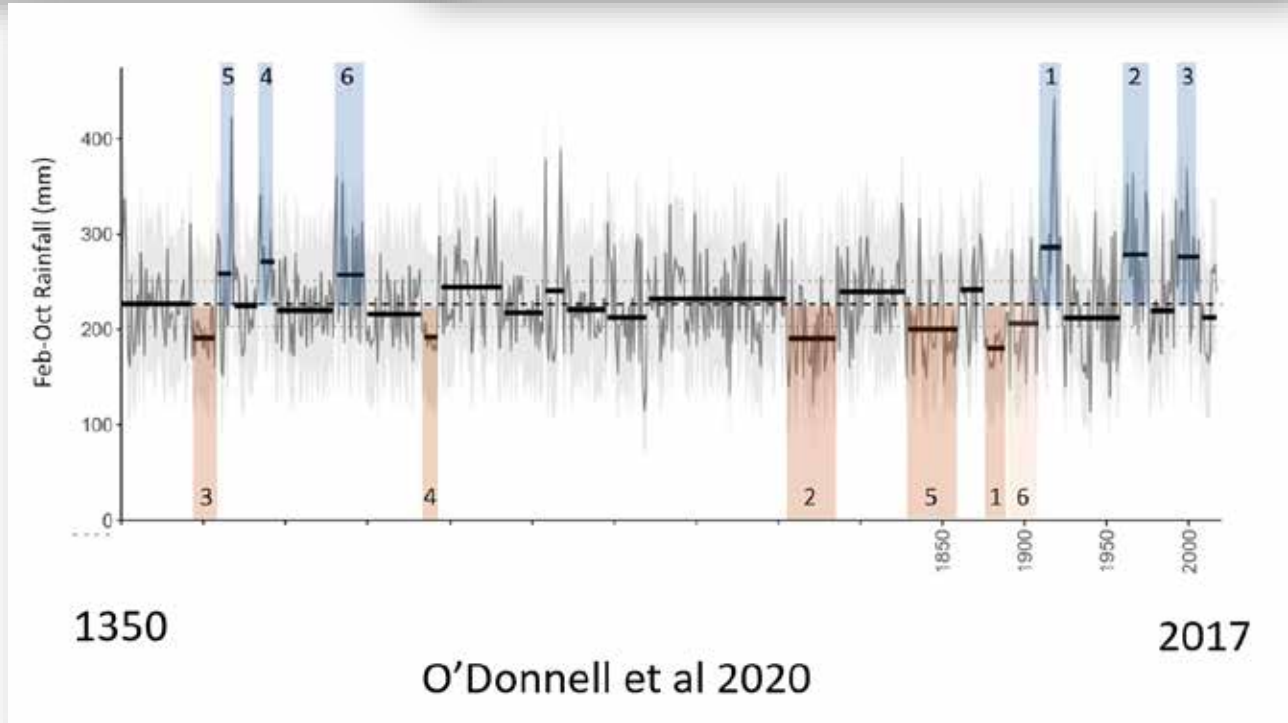
Todays talk

- Wheatbelt prehistory
- Climate & clearing
- Watertables and salinity
- Water balance of sands
- Excess water – a risk or an opportunity
- Questions

Wheatbelt prehistory

- The Wheatbelt is old
- Ancient rivers left deep channels and **sand sheets**
- Weathered granites, 30-50m clay subsoils, large salt stores; **alluvial, aeolian and colluvial sand cover**.
- SW drying for 1 M years, legacy of **‘sand and salt’** driven arid phases.
- Vegetated & stable last ~ 6-10,000 years
- Post development, clearing created a **new hydrology**





Clearing of ~15 M ha of Wheatbelt

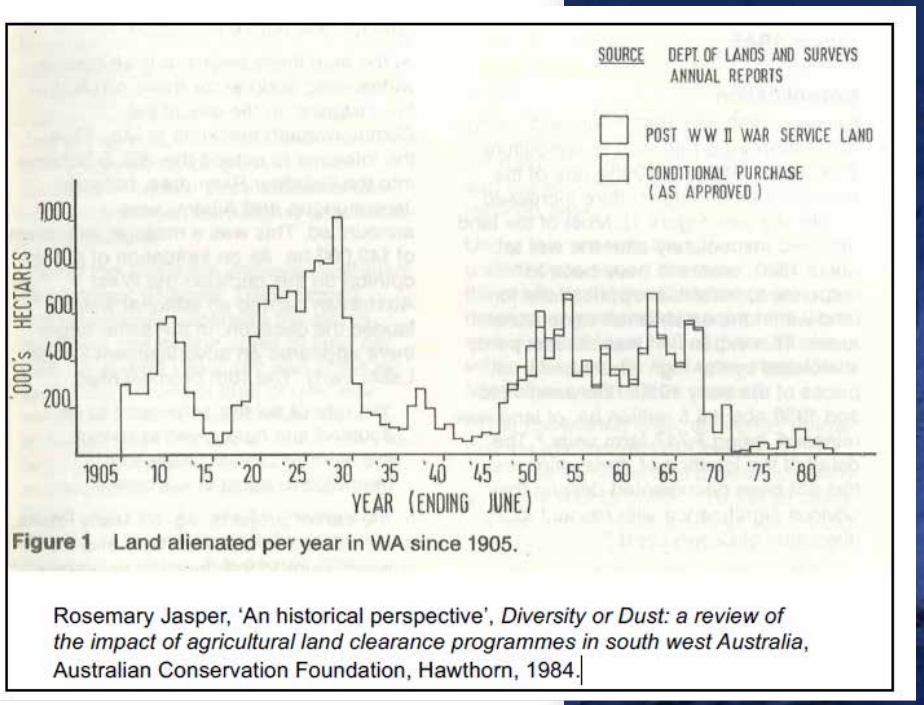
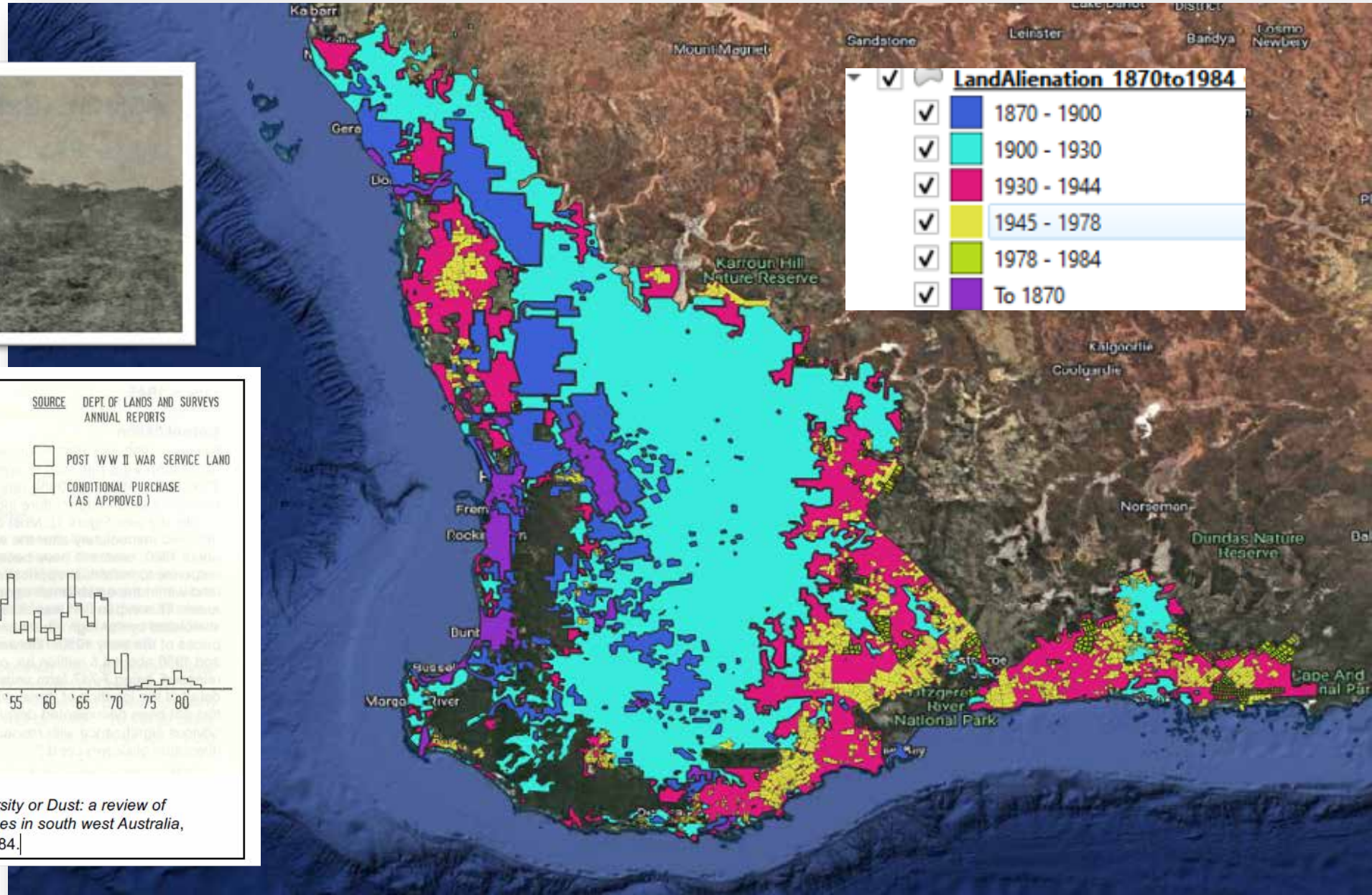


Figure 1 Land alienated per year in WA since 1905.

Rosemary Jasper, 'An historical perspective', *Diversity or Dust: a review of the impact of agricultural land clearance programmes in south west Australia*, Australian Conservation Foundation, Hawthorn, 1984.



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Review

Australian Journal of Soil Research, 2008, **46**, 751–767

Modern and palaeogeographic trends in the salinisation of the Western Australian wheatbelt: a review

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Modern salinity is caused by… clearing

…in 2001 it affected more than 1 M ha….

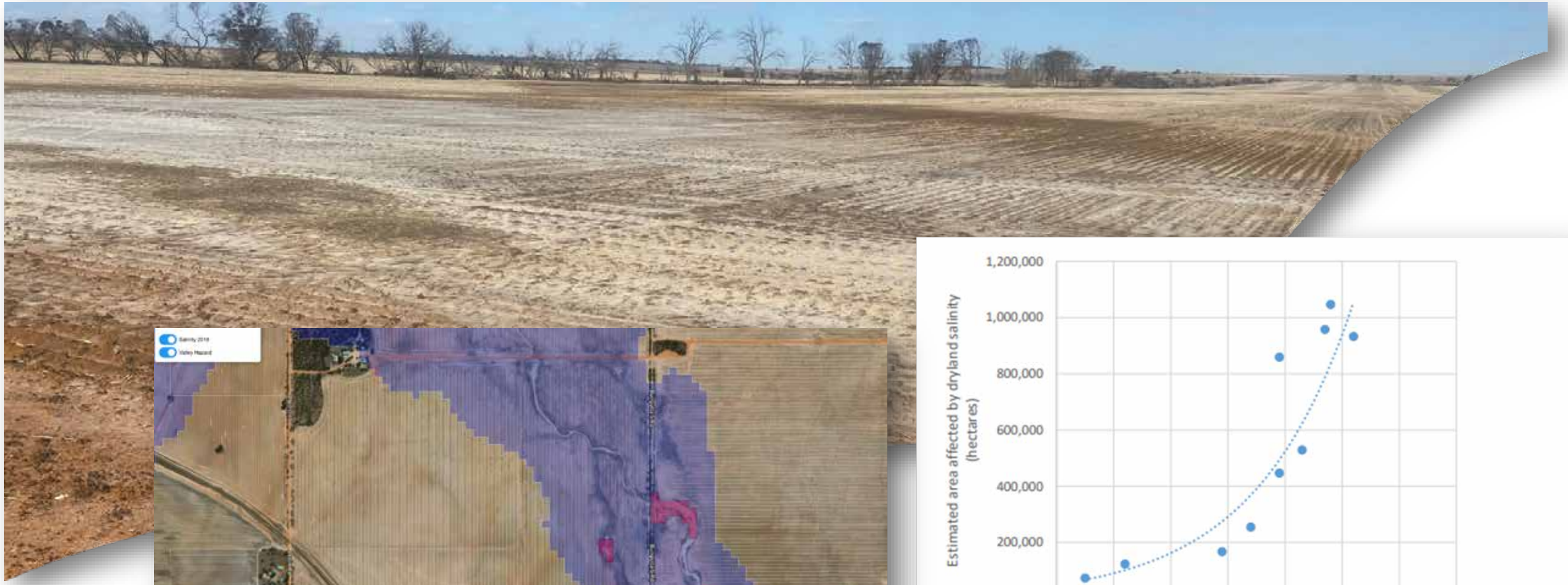


Figure 1 ABS survey results of estimated area affected by dryland salinity from 1955 to 2001.

…and, its still developing…. in 2018 we estimated…

1.7 M ha

Satellite (LANDSAT) pixels ‘unbiased’ estimate of salinity extent at 1,748,366 ha ± 343,692 ha at the 95% confidence level.

The *Land Monitor* mapping overall accuracy of 96.9%, a relatively low error of commission (3.1%), and a relatively high error of omission (40.0%).

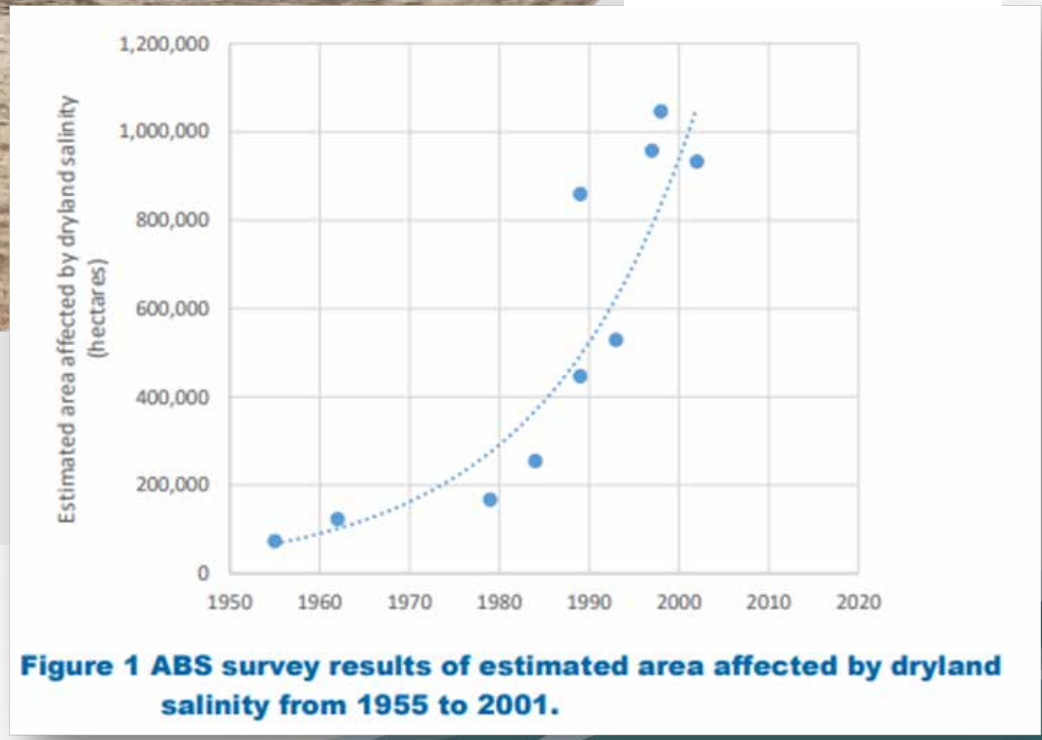
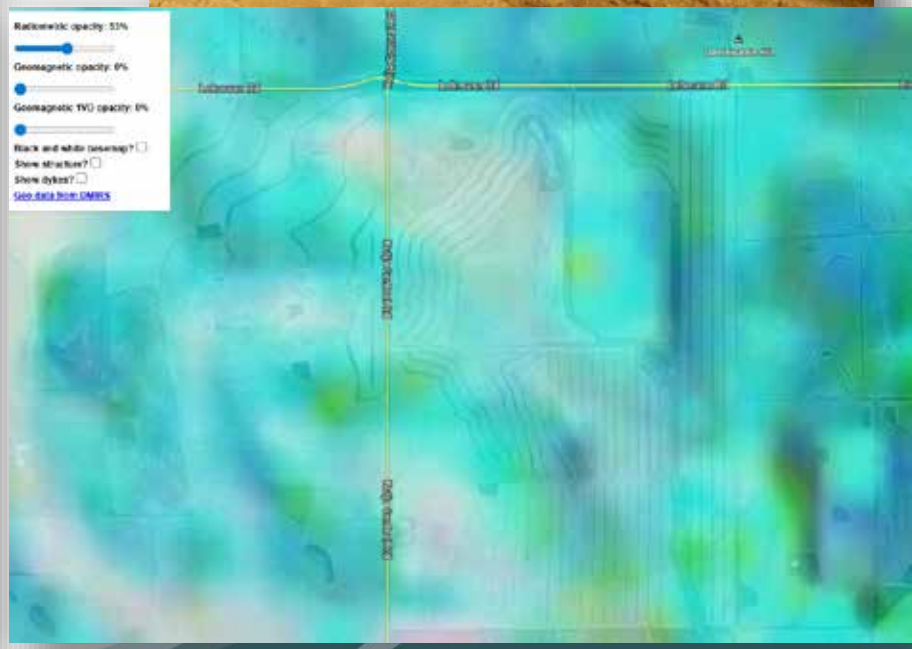


Figure 1 ABS survey results of estimated area affected by dryland salinity from 1955 to 2001.

Water…
Why…
Where…
Sandy soils?



Do crops (still) leak?

Aust. J. Agric. Res., 2001, **52**, 45–56

Potential deep drainage under wheat crops in a Mediterranean climate. I. Temporal and spatial variability

S. Asseng[AD], *I. R. P. Fillery*[A], *F. X. Dunin*[A], *B. A. Keating*[B], *and H. Meinke*[C]

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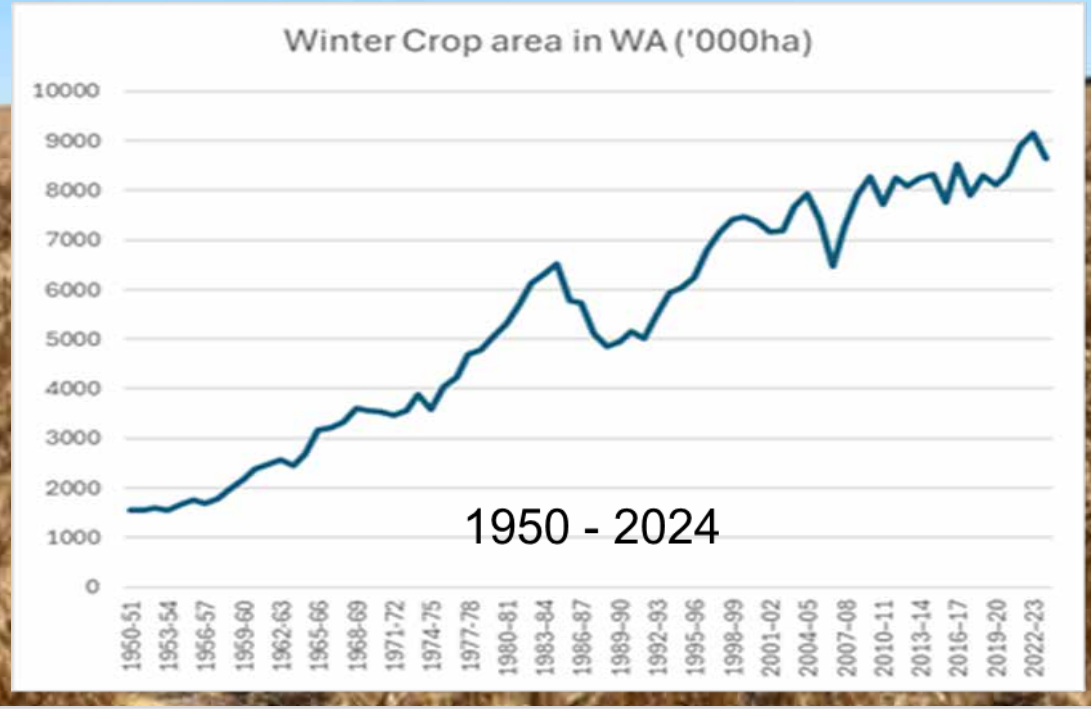
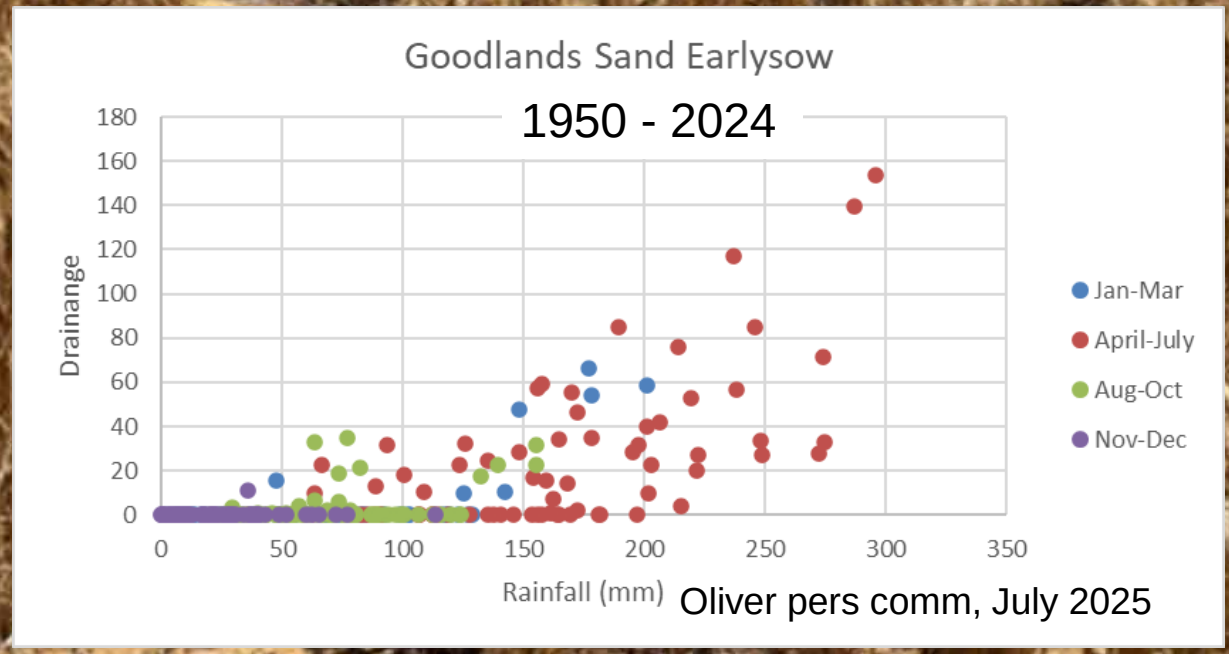
[C] APSRU/DPI, PO Box 102, Toowoomba, Qld 4350, Australia.
[D] Corresponding author; email: s.asseng@ccmar.csiro.au

Table 4. Simulated long-term average deep drainage (mm) below the root-zone with 30 kg N/ha for a deep sand, a clay, and a deep loamy sand at Moora (high rainfall region), Wongan Hills (medium rainfall), and Merredin (low rainfall), with resetting the soil water profile and without resetting

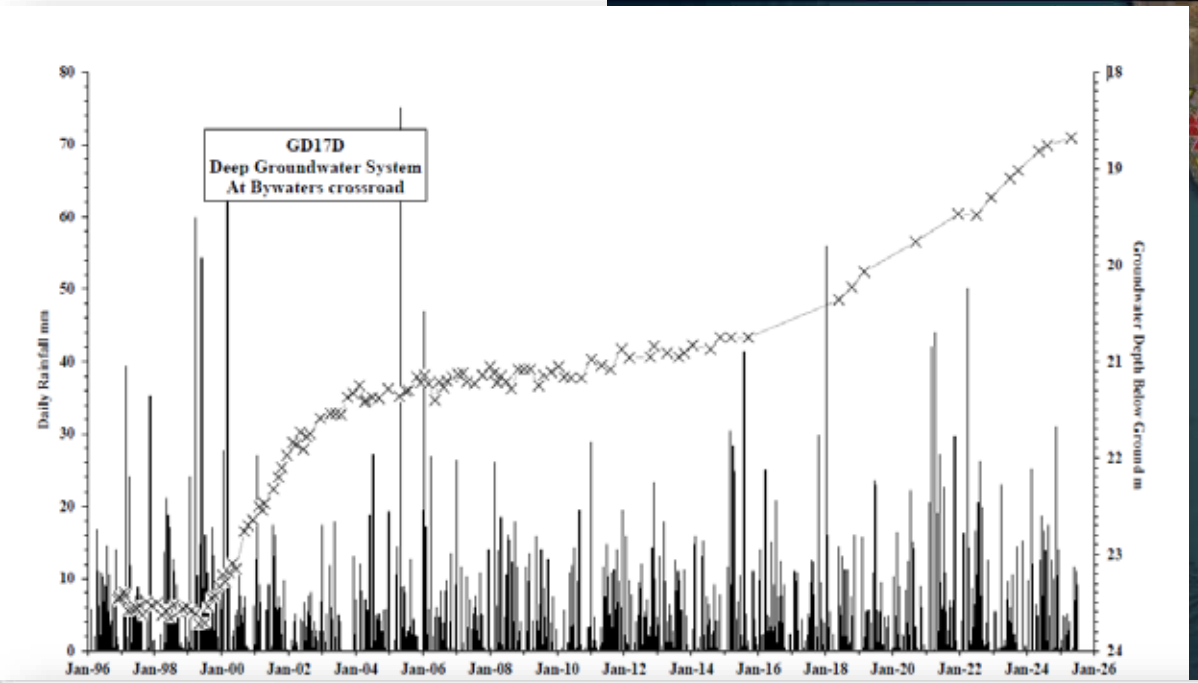
Soil type	PAW[A]	Deep drainage Rainfall region: High	Medium	Low
	With resetting[B]			
Deep sand	55	134	90	36
Clay	109	57	26	4
Deep loamy sand	130	68	34	7
	Without resetting			
Deep sand	55	149	103	49
Clay	109	73	35	6
Deep loamy sand	130	139	97	39

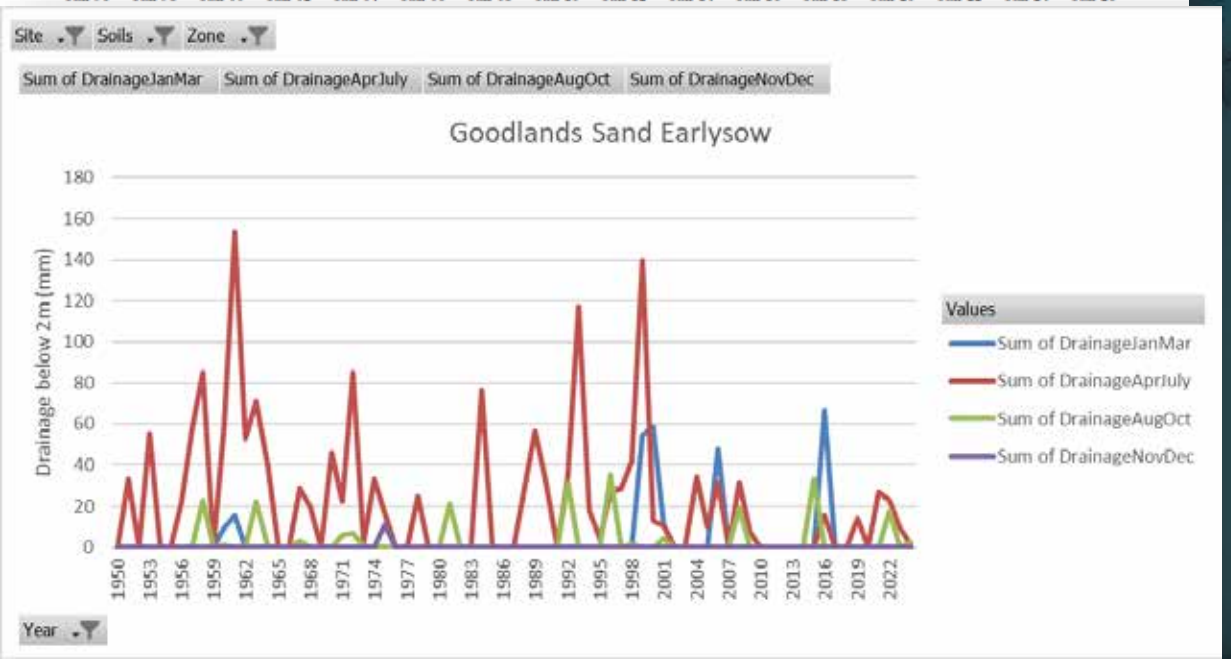
[A] Plant available water in potential rooting depth.
[B] Resetting soil water profile to plant available lower limits at 1 January each year.

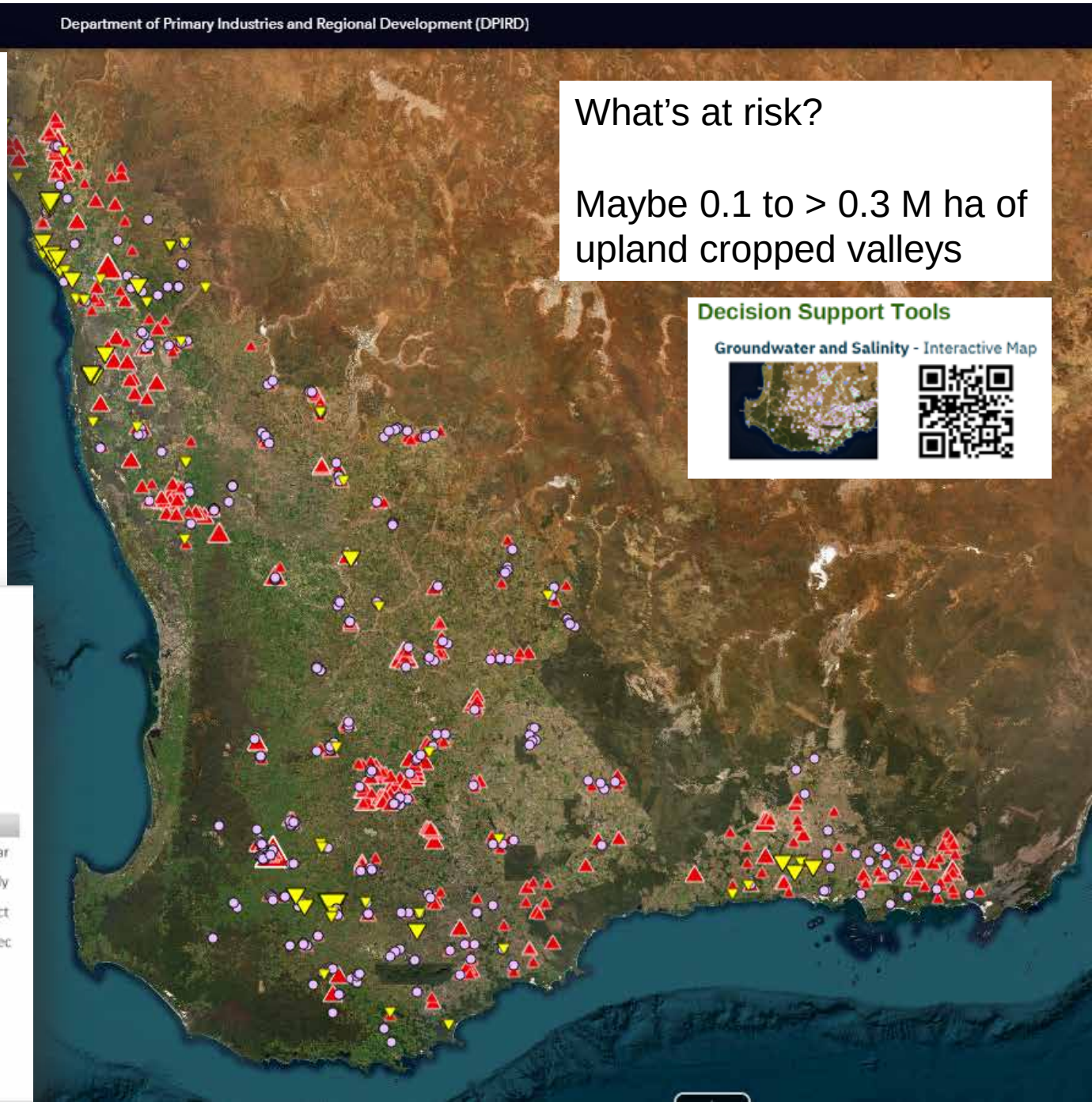




Oliver pers comm, July 2025







What's at risk?

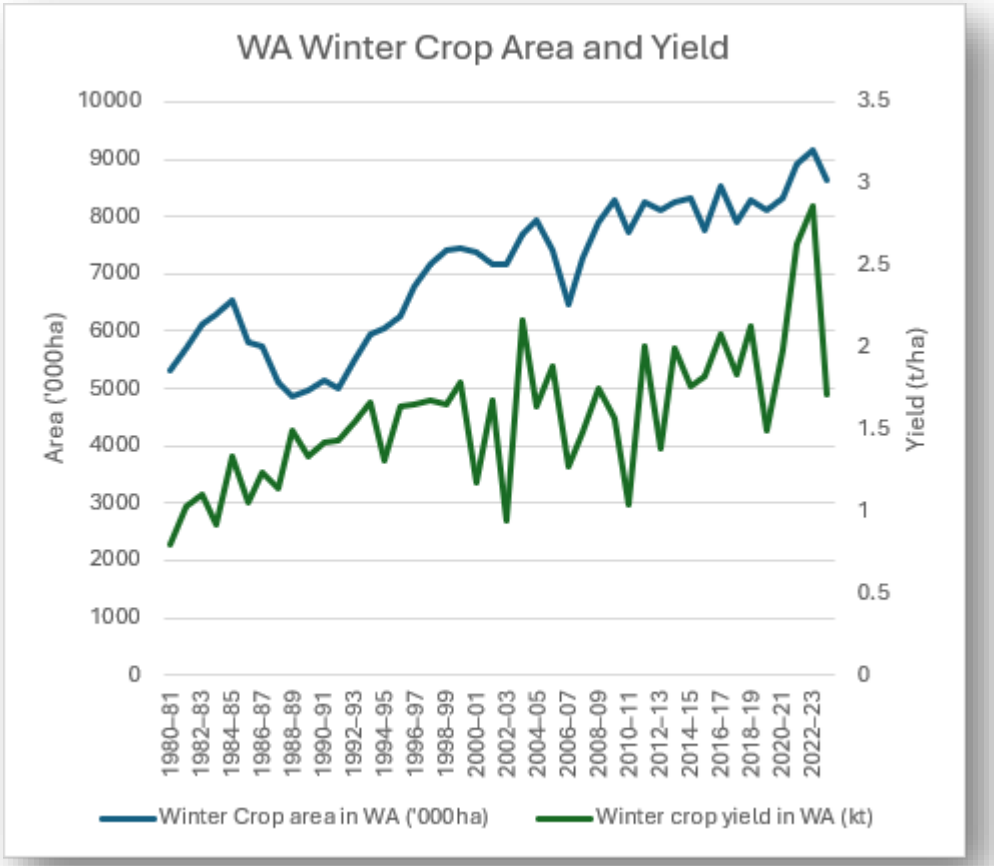
Maybe 0.1 to > 0.3 M ha of upland cropped valleys

Decision Support Tools

Groundwater and Salinity - Interactive Map

Reversing the trend

Use it… or change landuse



Kalannie grower Bob Nixon and DPIRD researcher Dr Gaus Azam in the graveyard trials looking at root growth responses to amelioration and improved soil pH.

WaterSmart projects

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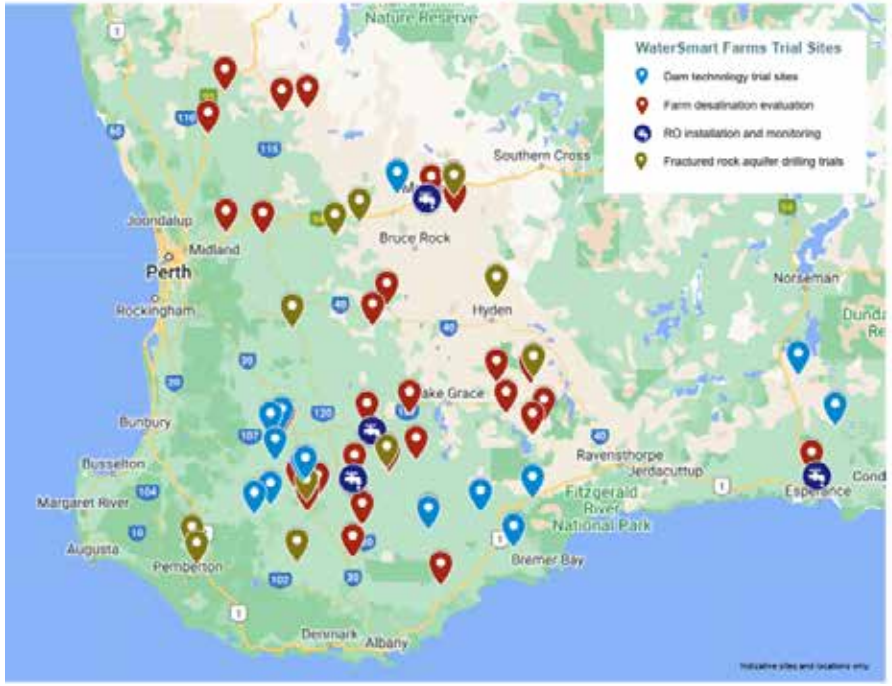
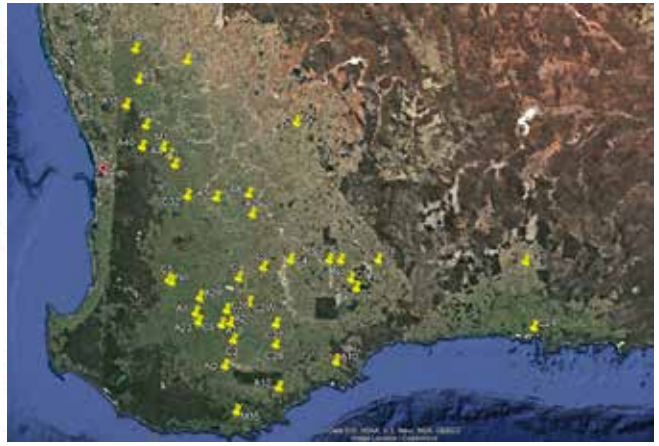
WaterSmart Farms

Water security and resilience in a drying climate



31	on-farm desalination units being assessed to capture learnings and experiences of farmers
12	dam technology demonstration sites
3	town based reverse osmosis desalination systems installed at Dumbleyung, Katanning and Merredin
1	off grid reverse osmosis desalination pilot and reject water reuse trial at Wongutha CAPS (Gibson)
18	fractured rock aquifer trial bores drilled to test targeting methodology using geophysical assessment technologies

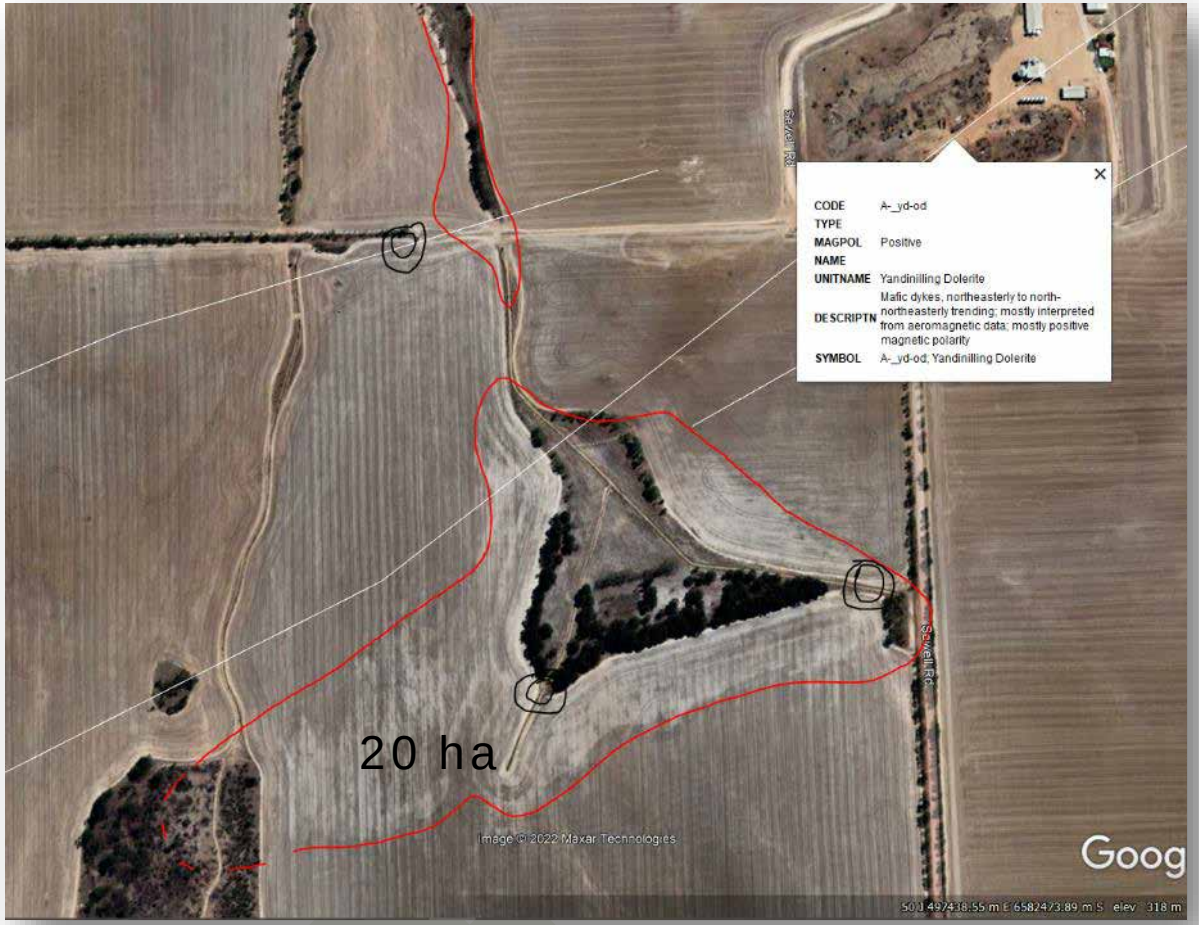


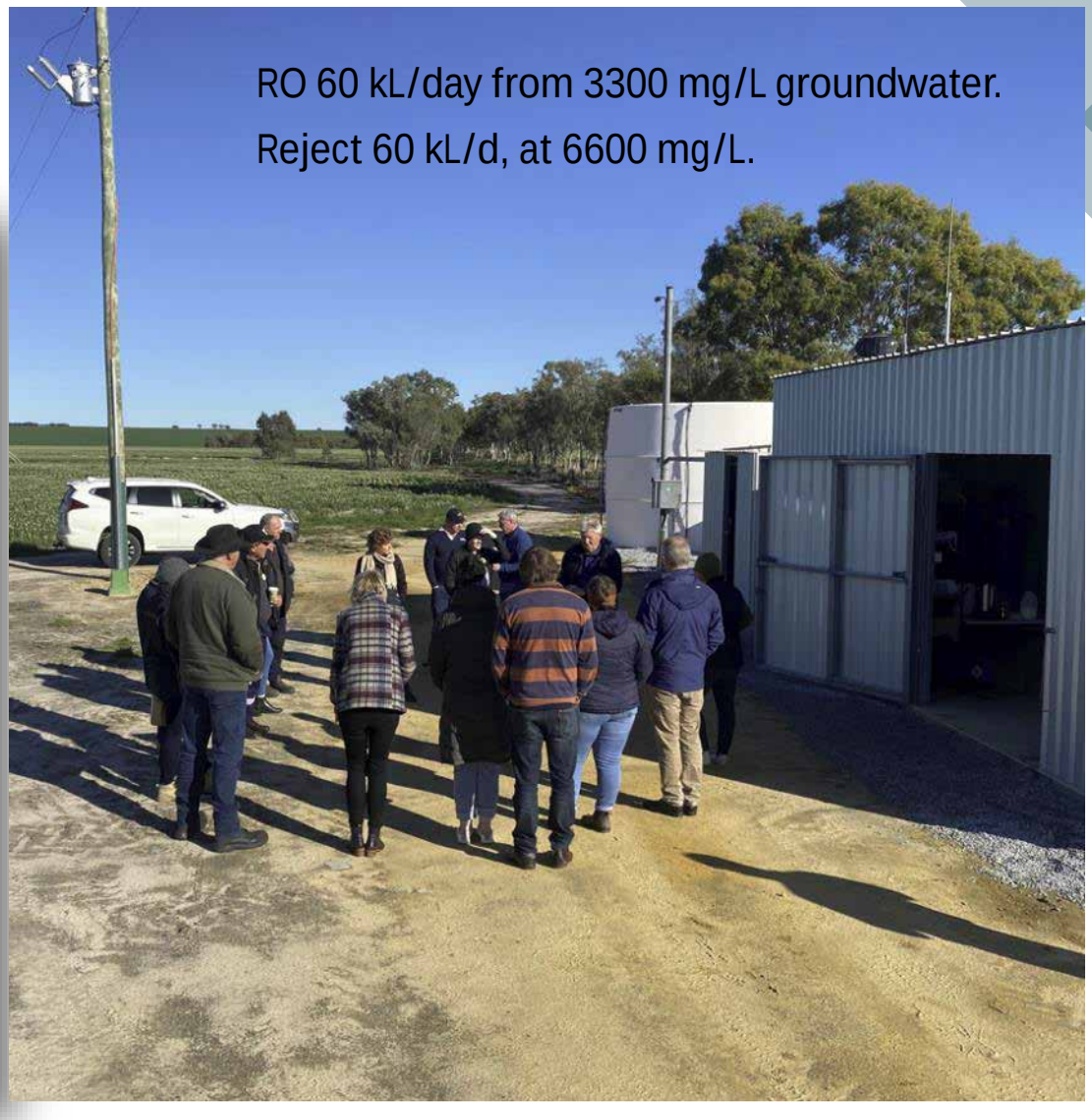
WA farmers use desalination to secure water supplies, restore salt-damaged land

By Lucinda Jose · By Belinda Varischetti · ABC Rural · Water

Thu 6 Jun

Wongan Hills – lowering watertables and making water from ‘leakage’





Summary

- The Wheatbelt water balance **has** changed
- Leakage from **sandy soils** is a major source and likely lead to **new** salinity
- Develop options to **reduce leakage**, or look at alternative species / systems
- Access excess water and treat for use as a new Wheatbelt resource
- Seek **motives** and **means** to change

Thank you

dpird.wa.gov.au

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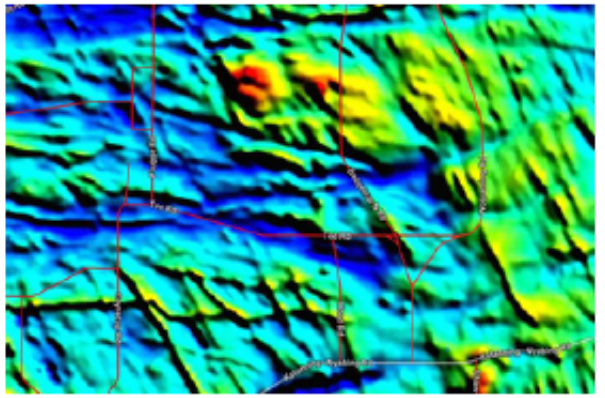
GeoMap - Geology & Geophysics



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