



Managing Mallee Seeps Workshop.

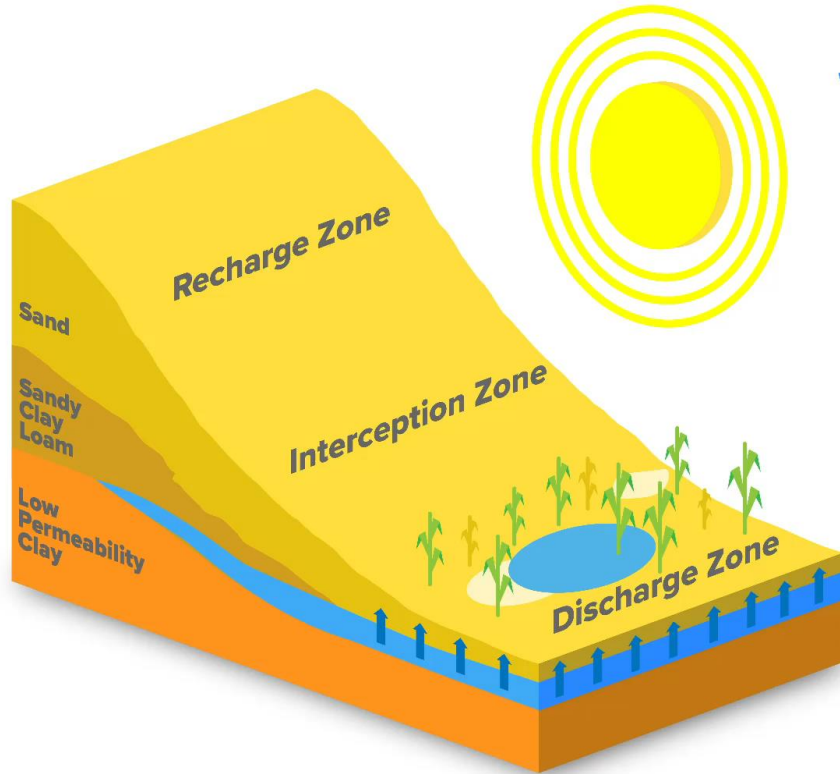
CHRIS MCDONOUGH, INSIGHT EXTENSION FOR AGRICULTURE



Workshop plan...

- ▶ 5 key steps to approaching and fixing Mallee Seep
- ▶ Using the Mallee Seep Decision Tree Demonstration
- ▶ Using DecipherAg NDVI app to assess your mallee seep demonstration
- ▶ Final Questions/comments

View full 2 minute animation at the MSF Website, Mallee Seeps Decision Tree
<https://msfp.org.au/mallee-seeps-decision-tree/>



What is a Mallee Seep?

A Mallee Seep is an area affected by a localised perched water table,

that brings water and salt to the surface soil layers

that can result in surface ponding and bare saline scalding over time.

2 main aims for all Mallee Seep Management:

1. Establish living cover over scalded bare areas, *and*
2. Intercept and utilise excess water flows to the perched water table.

5 Key Questions for Managing Mallee Seeps

1. **Is it a Mallee Seep?** – not Regional Groundwater, Streamline Salinity or Dry Saline Land (magnesia) as all have differing causes and solutions
2. **Where's the excess water's coming from?** Look at the landscape and the recharge, discharge and potential interception zones
3. **What stage of development is it at?** – Early mild, Intermediate moderate, Established severe. Early action is key to optimising results.
4. **What is the salinity of the water table?** – The lower the salinity the more positive options you have towards achieving full restoration
5. **What can you do to turn things around and restore sustainable production?** – See the Mallee Seeps Decision Tree at <https://msfp.org.au/mallee-seeps-decision-tree/> for many practical management options and short videos of rehabilitated sites.

Is it a Mallee Seep?

not Regional Groundwater, Streamline Salinity or Dry Saline Land (magnesia) as all have differing causes and solutions



Mallee Seep

A Mallee Seep is defined as an area affected by a localised perched water table (sitting above tight clay layers) that bring water and salt to the surface, leading to land degradation.



Click to choose



Regional Groundwater Salinity

Regional Groundwater Salinity involves areas of shallow saline regional water systems (within 5-10m of the surface) in the Upper South East of SA and on River Murray tributary lines that cause saline degradation in surface layers.



Regional Creek-line Salinity

Regional Creek-line Salinity are areas of saline land within or adjacent to existing creek-lines whose water is often highly saline and emanating from higher catchment areas.



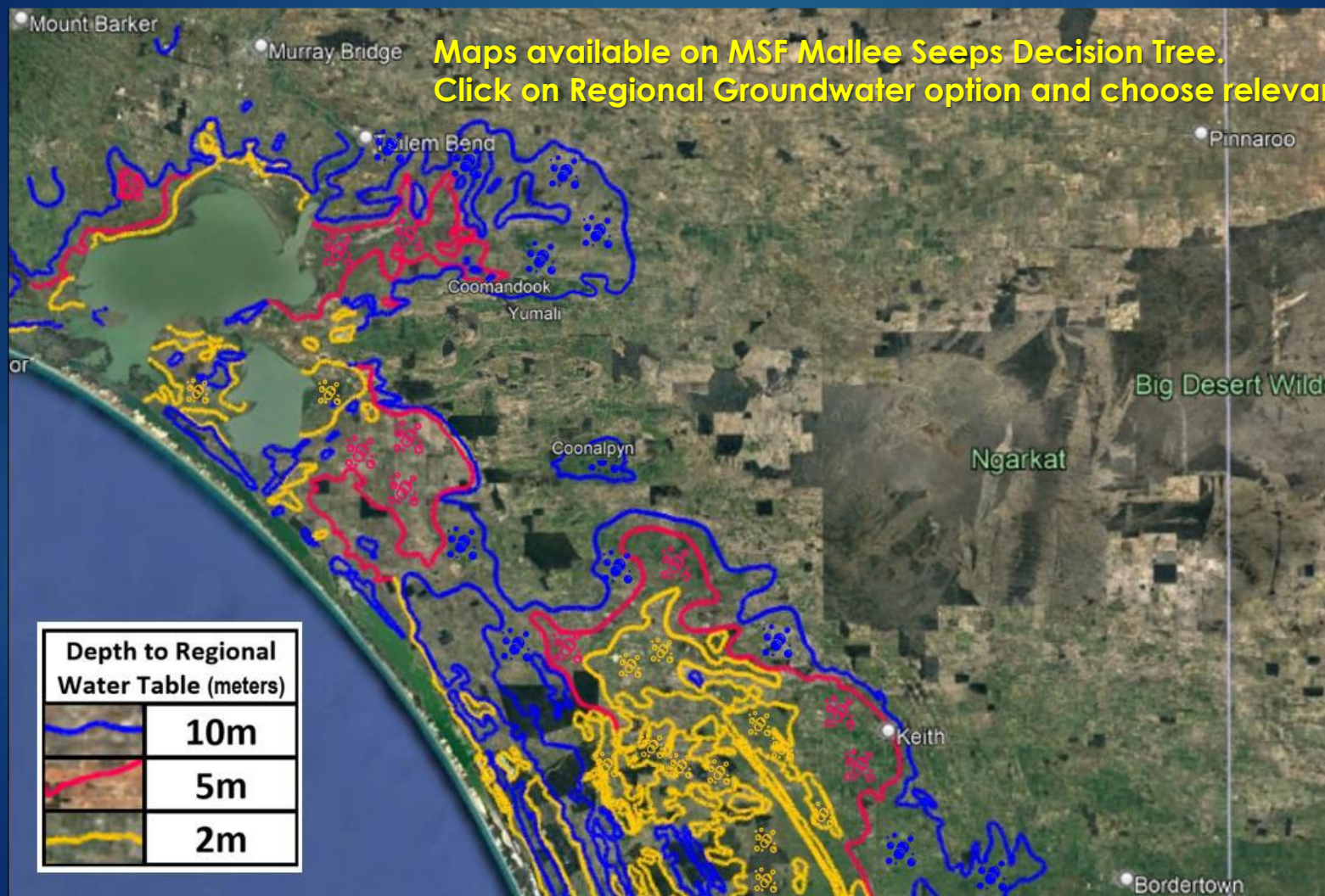
Dry Saline Land

Dry Saline Land (magnesia land)

are saline patches that are not formed due perched or regional water tables, but rather salt rising to the surface from subsoil clays, becoming worse after long dry periods.



Maps available on MSF Mallee Seeps Decision Tree.
Click on Regional Groundwater option and choose relevant map area.



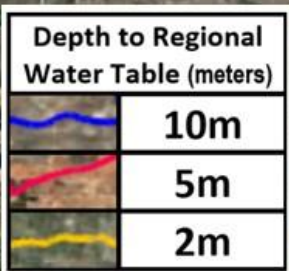
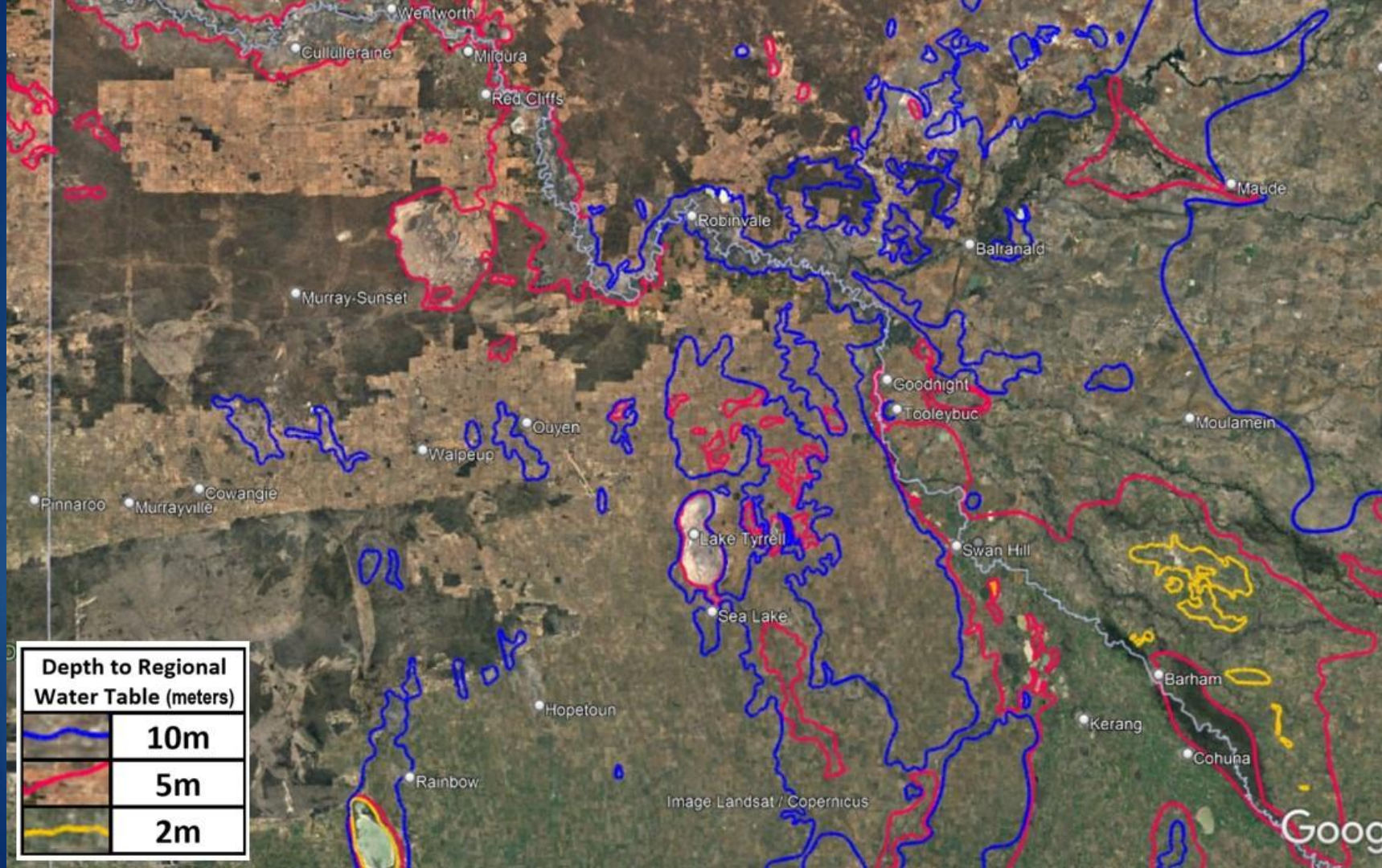


Image Landsat / Copernicus

Goog

**Mallee seeps
forming between
large historic salt
pan areas**

Bolton Nature
Conservation
Reserve

C251

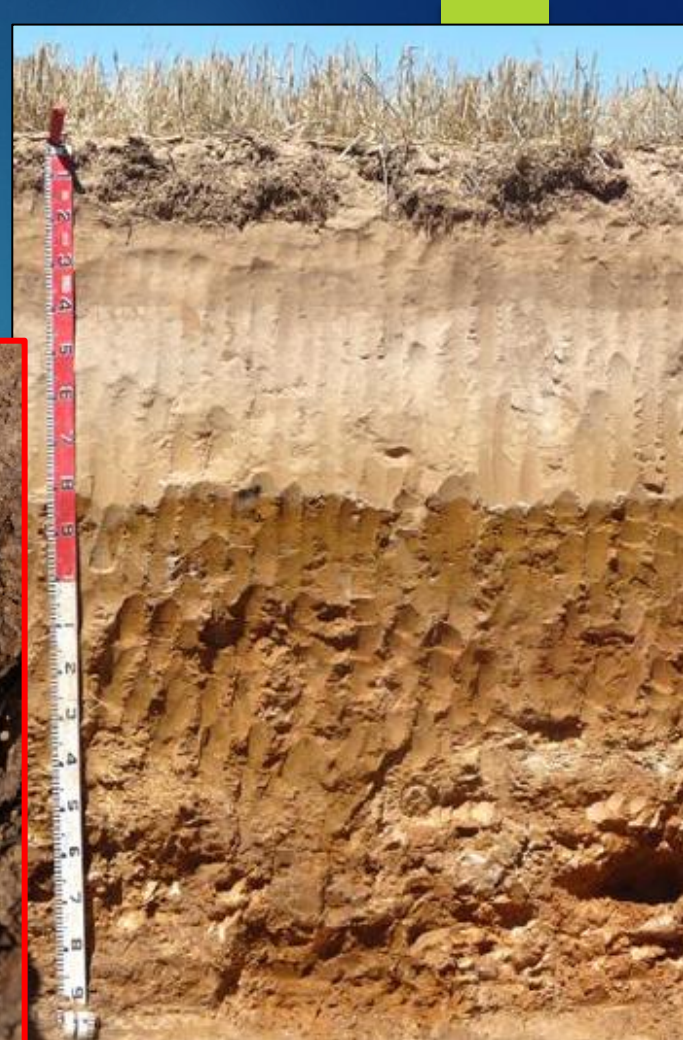
Myall
Bushland
Reserve

Bolton

2. Where's the excess water's coming from?

Look at the landscape and the recharge, discharge and potential interception zones







Dryer clay beneath
sloppy layer



Figure 7 A close-up of Blanchetown Clay from Site MDS-P07.

Using Satellite Images to Assess your Seeps



Figure 1. Site 1 NDVI image 29th October 2018 (2 seasons after very wet 2016 Spring) showing evidence of localised perched water tables causing extended growth well after crop/pasture senescence.

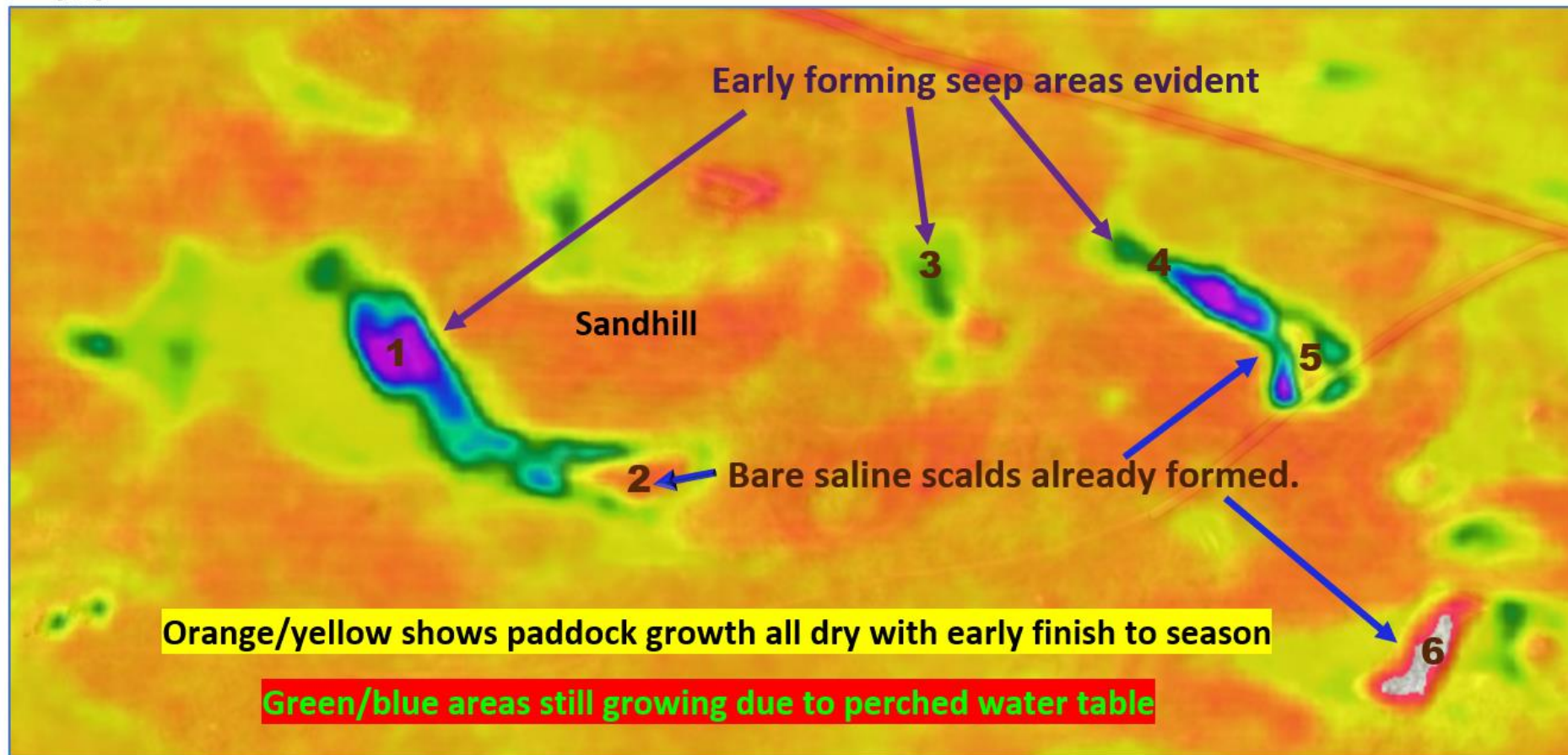
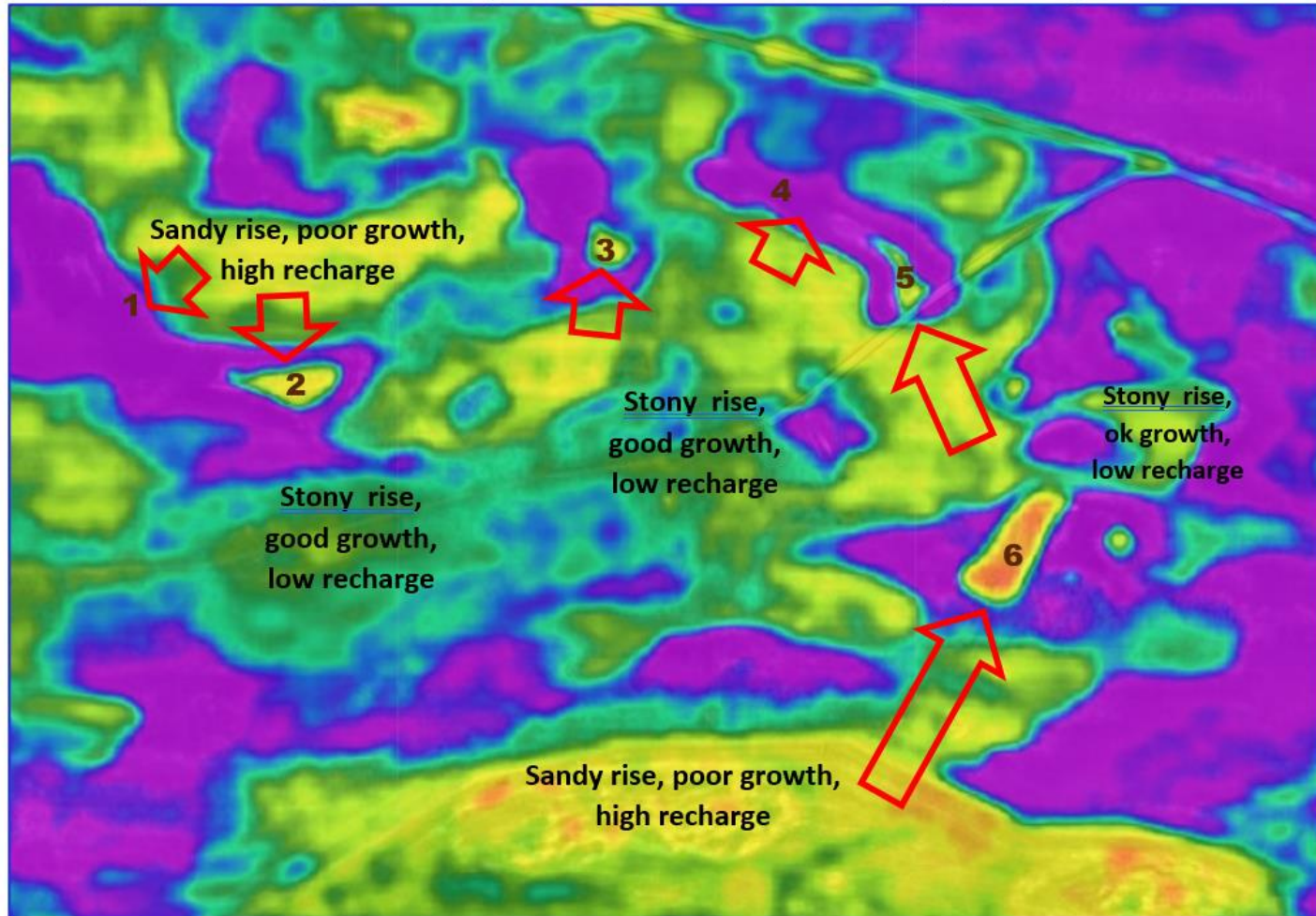


Figure 2. Site 1 NDVI image, Sept 2018 showing areas of deep sands and poor crop growth most likely contributing the recharge was water not the mallee seep discharge zones



The Site:

Emerging Seep
(no treatments)

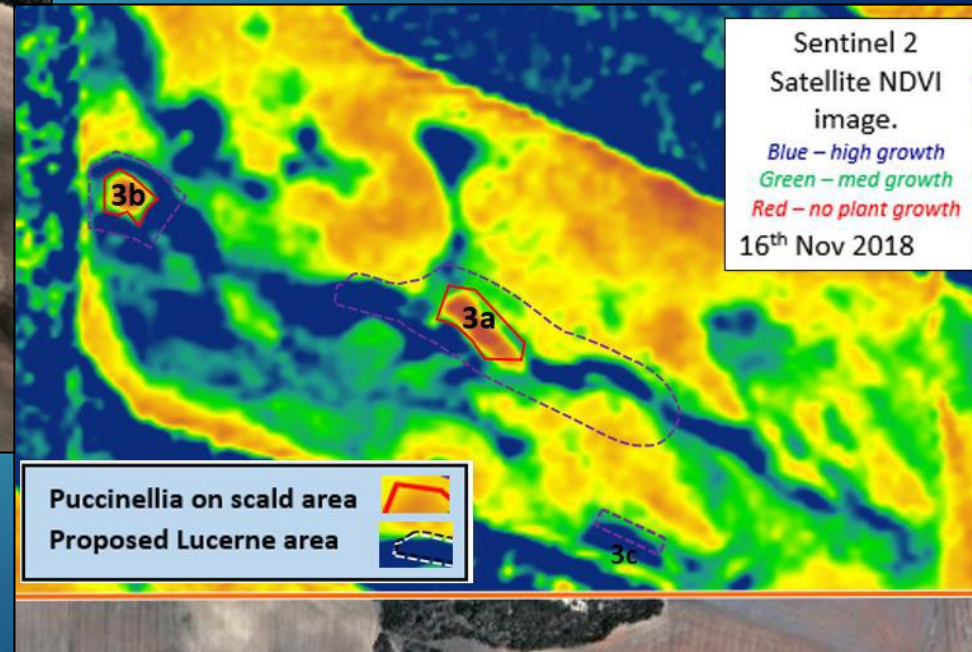
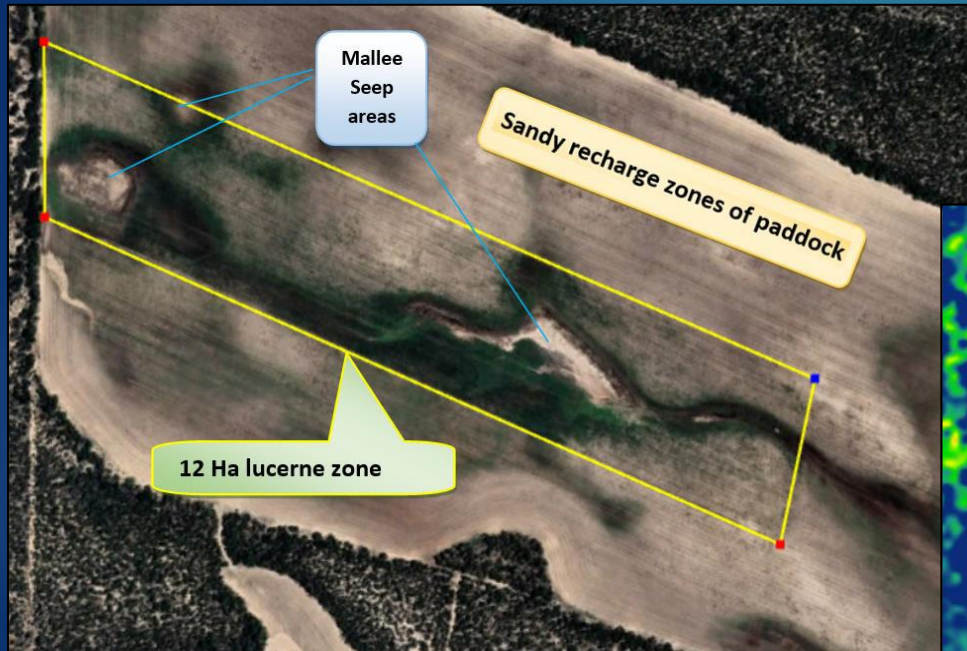
Large established
North Seep,

Emerging
East Seep,

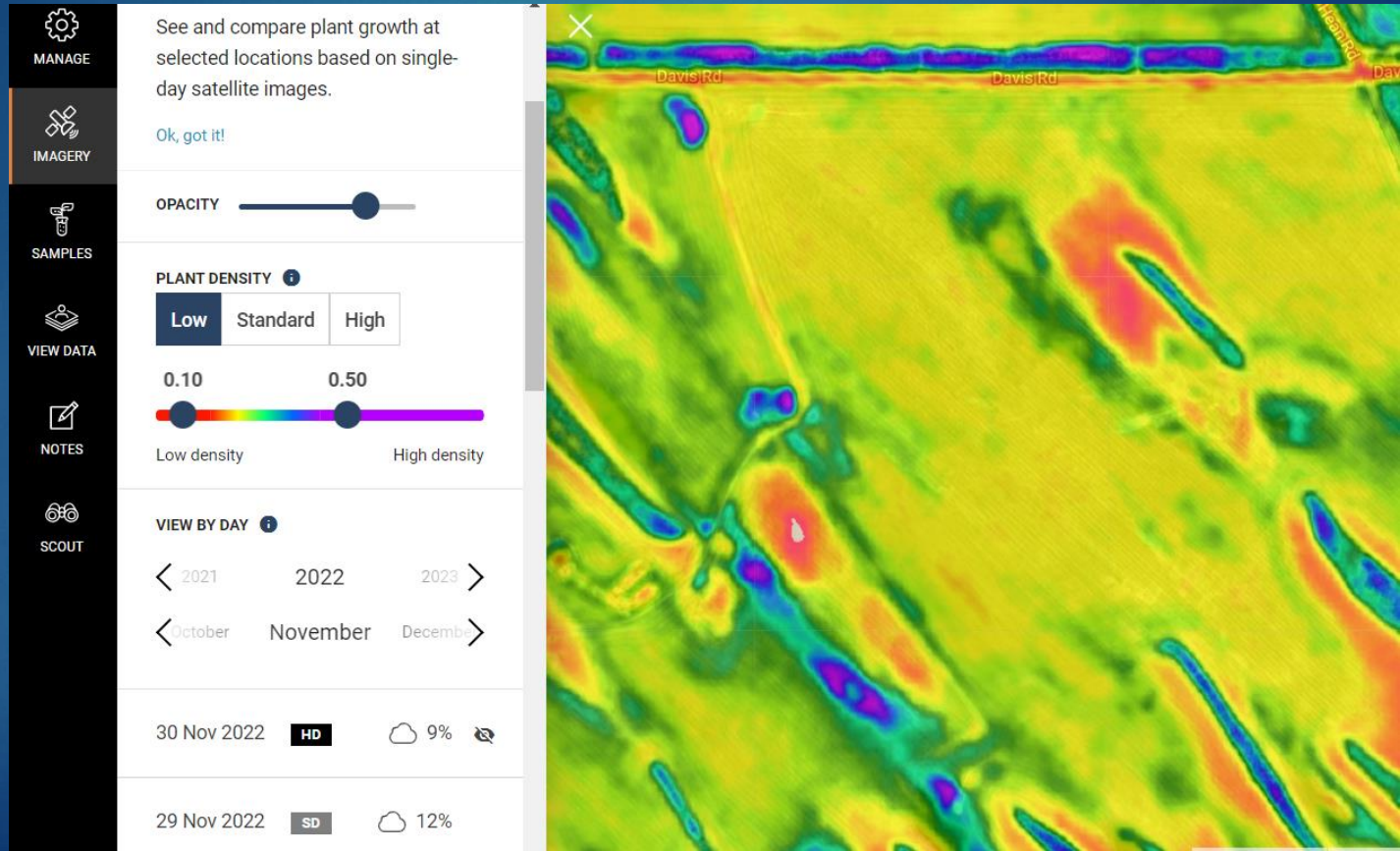
Large established
South Seep,



Assessing how seeps sites may be connected through local catchments

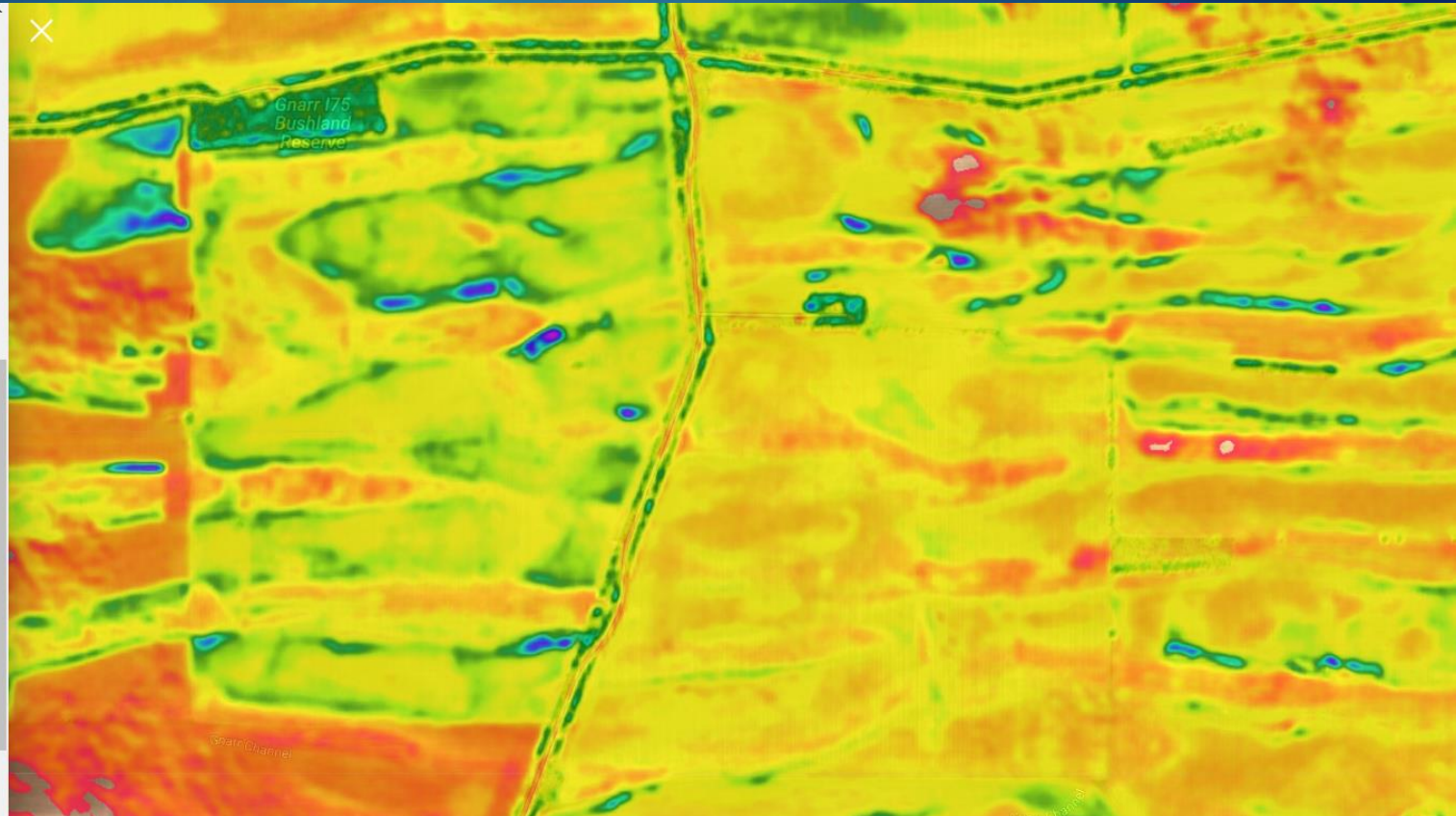


Using Decipher NDVI imaging app demonstration...



Using satellite images to help define extent of perched water tables and likely recharge key areas

VIEW BY DAY ⓘ			
< 2020	2021	2022 >	
< September	October	November >	
30 Oct 2021	HD	☁ 8%	🗖
25 Oct 2021	HD	☁ 0%	🗖
21 Oct 2021	SD	☁ 12%	
20 Oct 2021	HD	☁ 29%	🗖
15 Oct 2021	HD	☁ 41%	🗖
10 Oct 2021	HD	☁ 78%	🗖
05 Oct 2021	HD	☁ 31%	🗖



VIEW BY DAY ⓘ

< 2020 2021 2022 >

< September **October** November >

30 Oct 2021 **HD** 8%

25 Oct 2021 **HD**  0% 

21 Oct 2021 SD 12%

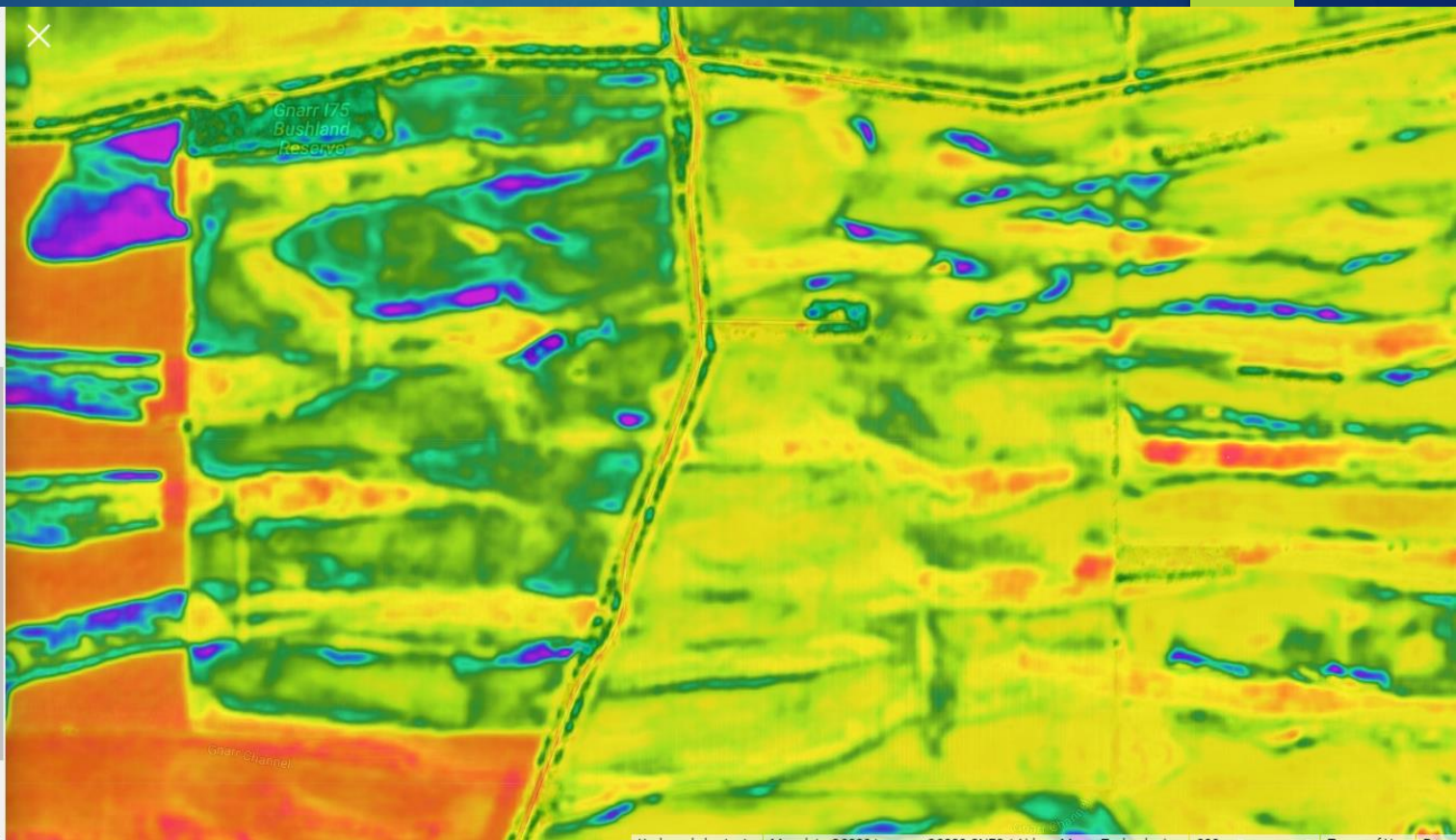
20 Oct 2021 **HD**  29% 

15 Oct 2021 **HD**  41% 

10 Oct 2021 **HD** 78%

05 Oct 2021 **HD**  31% 

05 Oct 2021  10%



3. What stage of development is it at?

*Early/mild, Intermediate/moderate,
Established severe.*

Early action is key to optimising results.



Early Mild Phase

Plant growth yellowing from waterlogging...



Early Mild Phase ??

Growing 2-3 times the crop at base of sandy rises



Early Mild Phase

Small bare patches developing...



Early Mild Phase

Areas remaining soft & boggy after wet periods...



Early Mild Phase

Areas remaining soft & boggy after wet periods...



Intermediate Moderate Phase

permanent scalds growing larger



Intermediate *Moderate* Phase ??



Intermediate Moderate Phase ??



Intermediate *Moderate* Phase ??



Intermediate *Moderate* Phase ??



Intermediate Moderate >> Severe Phase
large scalded areas, crusty surface, saline crystals evident after dry periods



Established Severe Phase



Established Severe Phase



Established Severe Phase ??



Established Severe Phase



Established Severe Phase



Established Severe Phase ??



Established Severe Phase



Established Severe Phase



??? After huge summer rains on EP



4. What is the salinity of the water table?

The lower the salinity the more positive options you have towards achieving full restoration

A taste test for salinity can go a long way to helping decide management options.

Essentially, if it is not too salty to use for stock water, then I think lucerne can be used close to seep scalds to reduce water levels.

However, using a salinity meter is vital for more objective information, vital for many situations.







Water Salinity	Deci siemens (dS/m)	Parts Per Million (ppm)
Low	<8	<5000
Medium	8-16	5000 - 10,000
High	16-35	10,000 – 21,000
Very High	>35	>21,000
1dS/m = 100 mS/m = 1000 μ S/cm = 640ppm = 640mg/L		

Salinity variations through the year

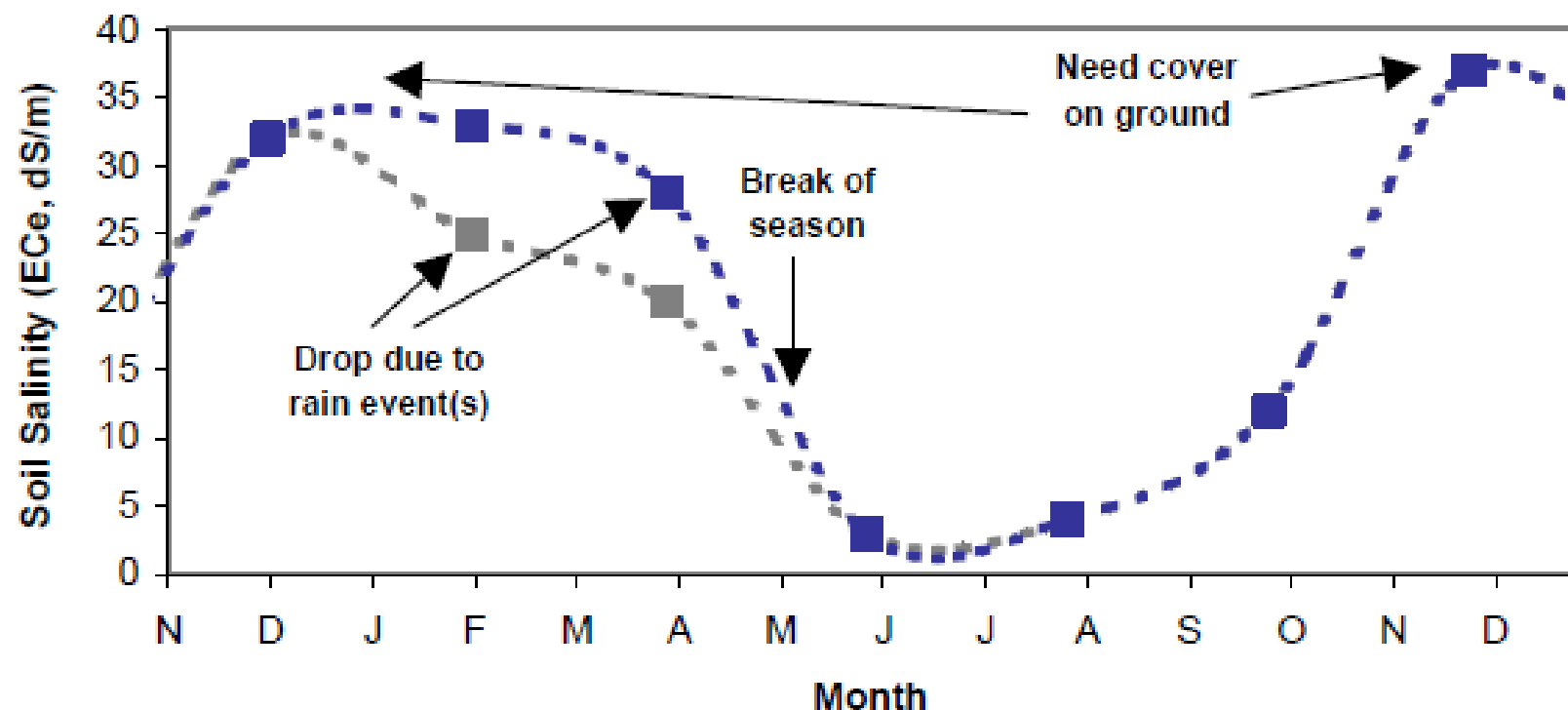
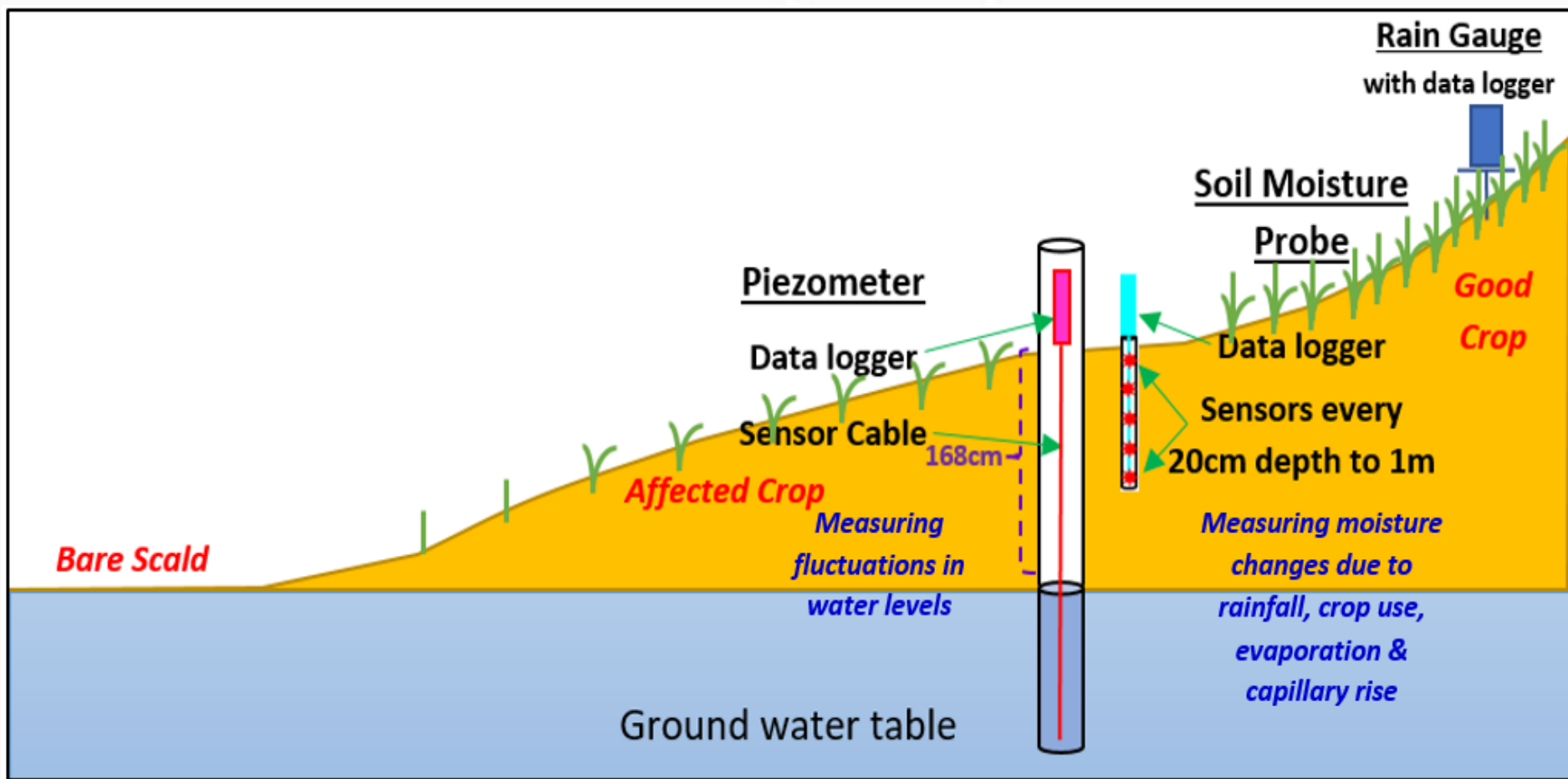


Figure 12. Example of seasonal trends in surface soil salinity. (Large seasonal fluctuations, especially in surface soil, such as this are often found in parts of the Upper South East.)





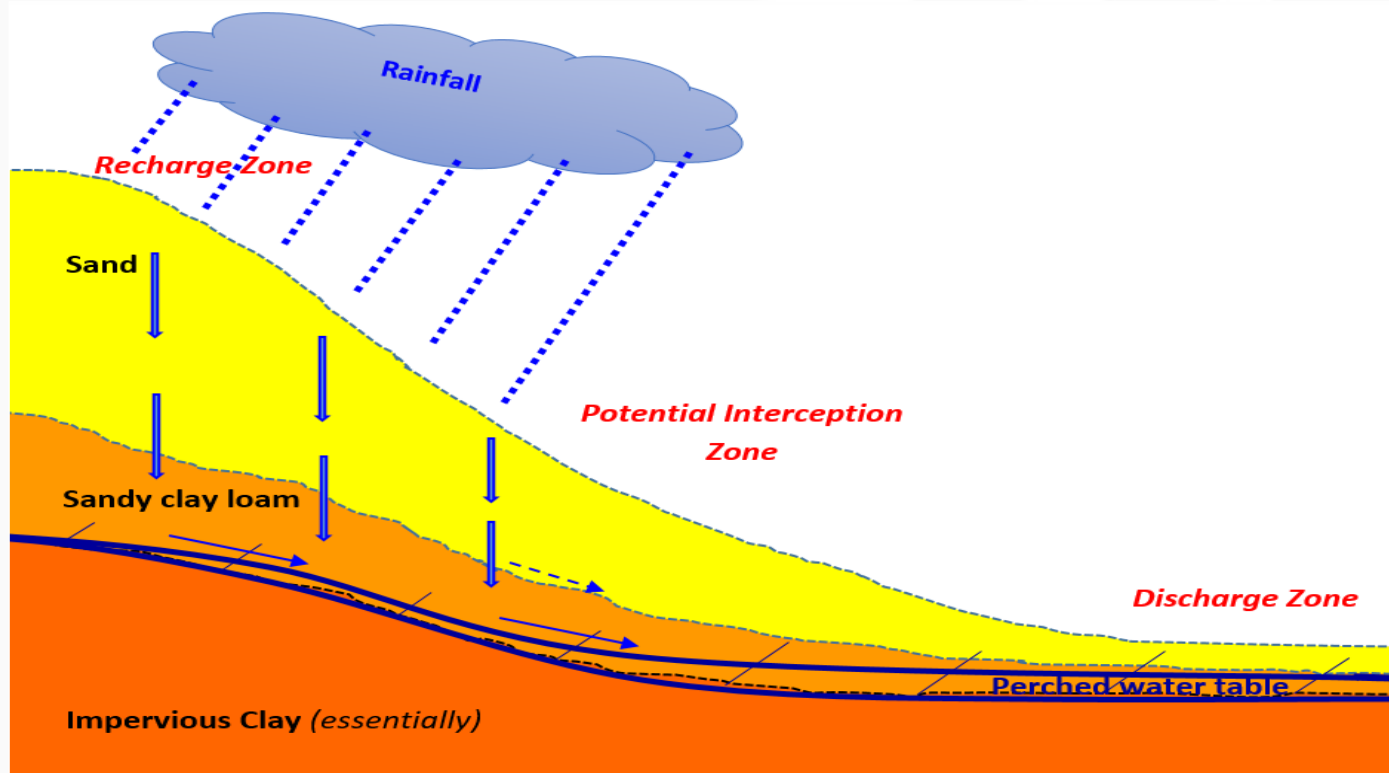


5. What can you do to turn things around and restore sustainable production?

For many practical management options and short videos of rehabilitated sites, see the Mallee Seeps Decision Tree at <https://msfp.org.au/mallee-seeps-decision-tree/>

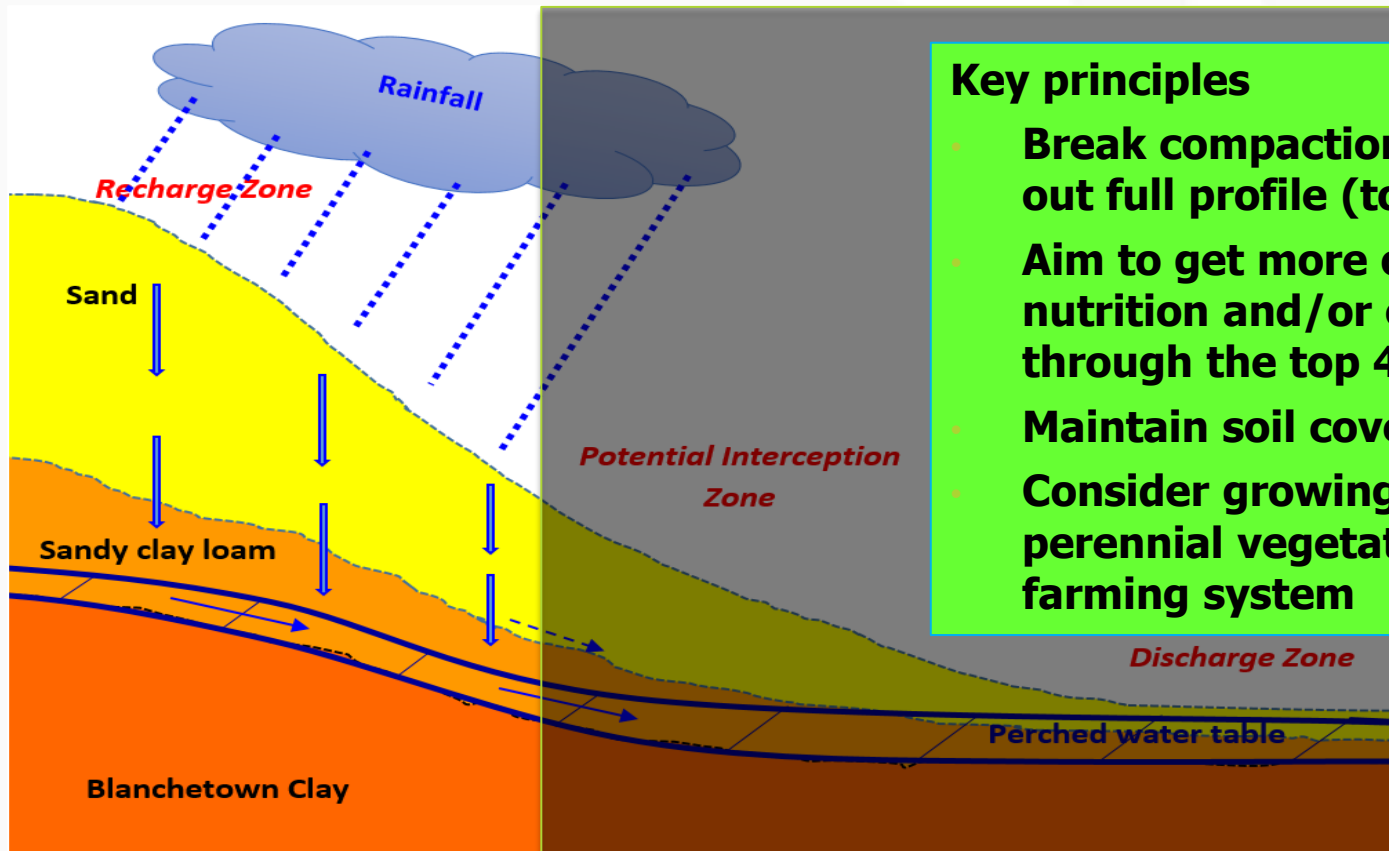


All site assessment and management advice based on 3 key zones





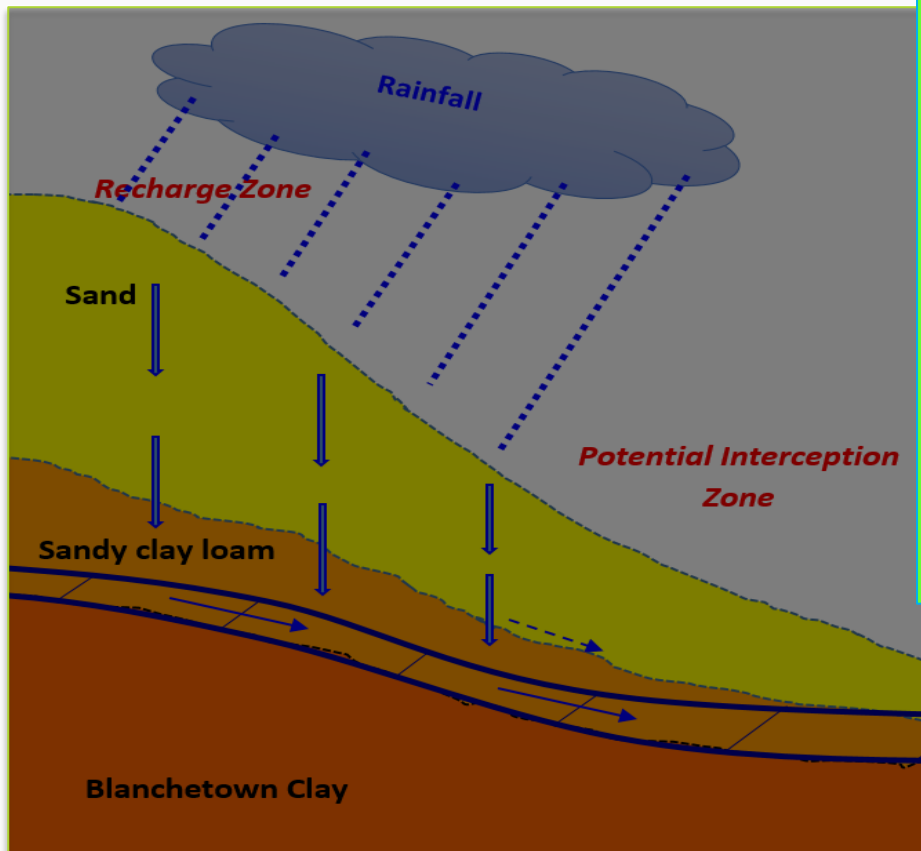
Recharge Zones



Key principles

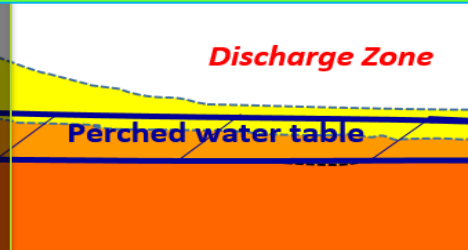
- Break compaction, allow crops to dry out full profile (to 1.5m depth)
- Aim to get more organic matter, nutrition and/or clay profiled through the top 40cm
- Maintain soil cover, minimise erosion
- Consider growing deep rooted perennial vegetation if fits with farming system

Discharge Zones



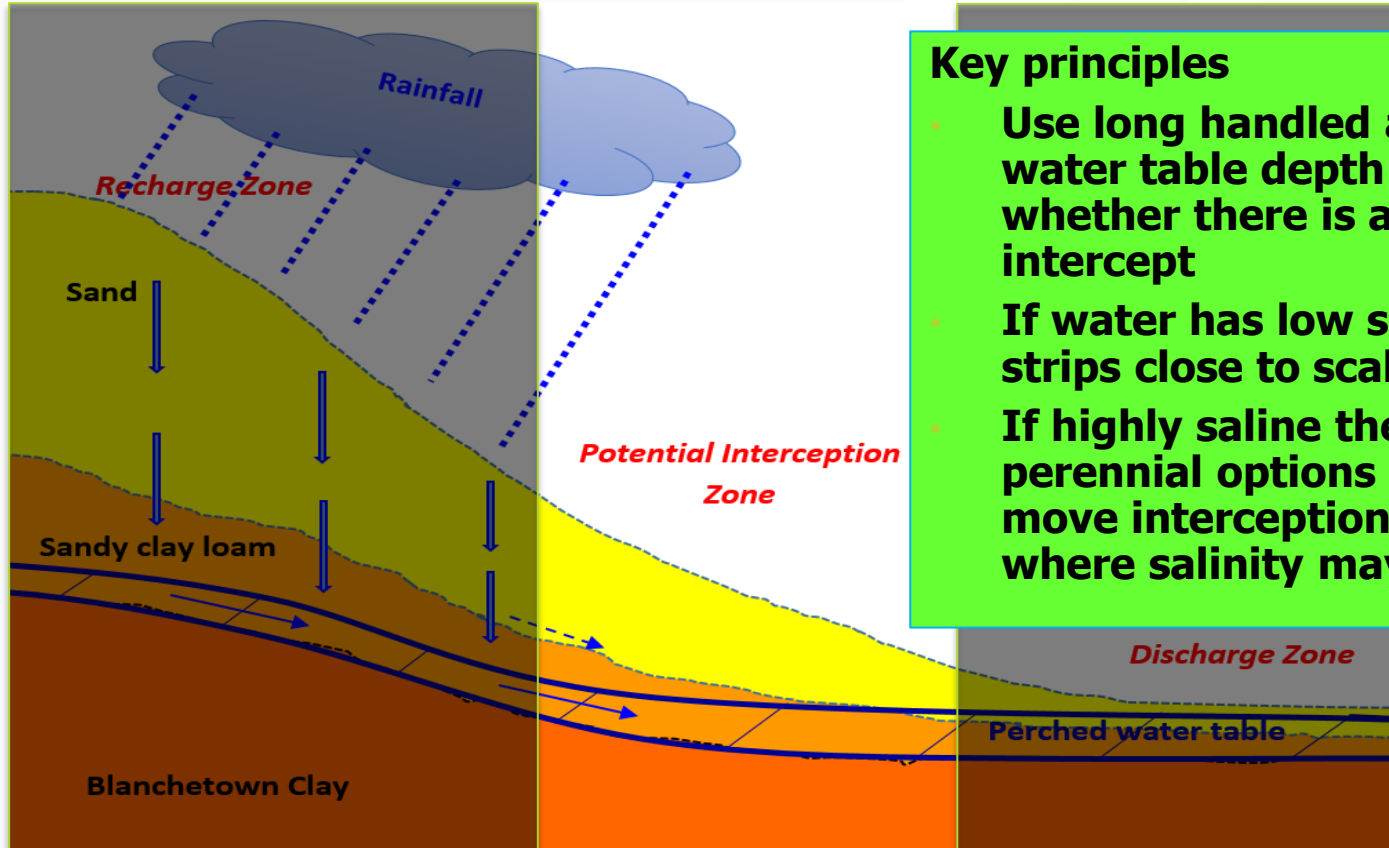
Key principles

- Can't stop the cause here, but can reduce, manage or reverse degradation
- Reduce capillary rise of moisture to the surface, evaporation and salt build up
- Will quickly degrade into saline scald if left bare over summer or drought periods
- Maintain living soil cover all year around if possible
- Salt tolerant pastures, summer crops, rehabilitate soil back to cropping...?



PRACTICAL MANAGEMENT OPTIONS

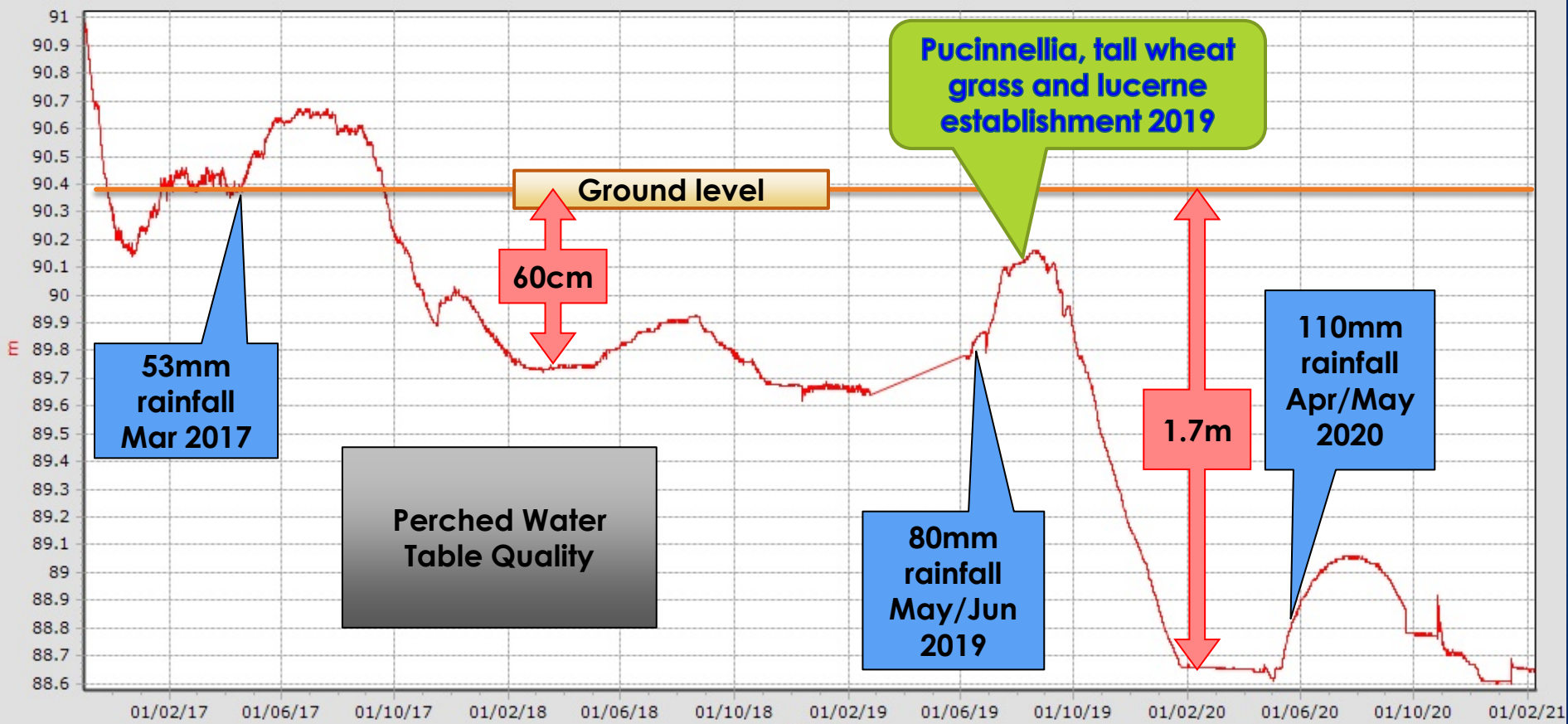
Interception Zone



Key principles

- Use long handled auger to find perched water table depth and quality and whether there is a lateral flow to intercept
- If water has low salinity levels, lucerne strips close to scald a good option
- If highly saline then more salt tolerant perennial options could be used, or move interception further up the rise where salinity may be lower.

Dramatic rapid drop in water after treatment



Using the Mallee Seeps Decision Tree demonstration...

<https://msfp.org.au/mallee-seeps-decision-tree/>



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MSF Membership

Mallee Seeps Decision Tree

A tool for the identification and rehabilitation of Mallee Seeps

Snapshots from various sites and Decision Tree videos...





Managing a seep with highly saline water



Watch later



Share

MORE VIDEOS



3:26 / 4:39



YouTube







Photo 7. Spreading puccinellia seed over the bare scald in June 2021, then drone view Dec 2021.





Nov 2020

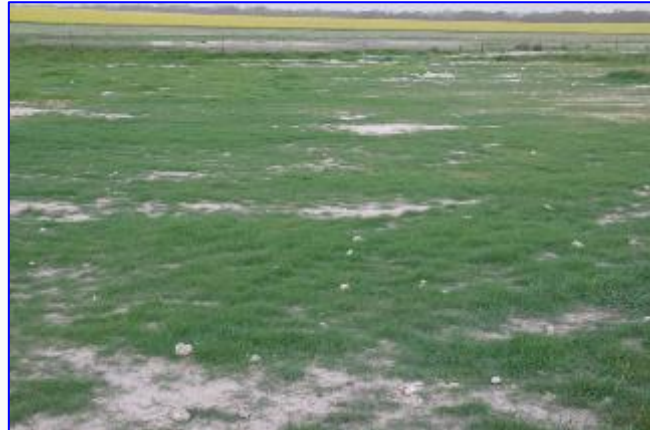
Puccinellia in original scald/lake

Lucerne drying up sandhill water

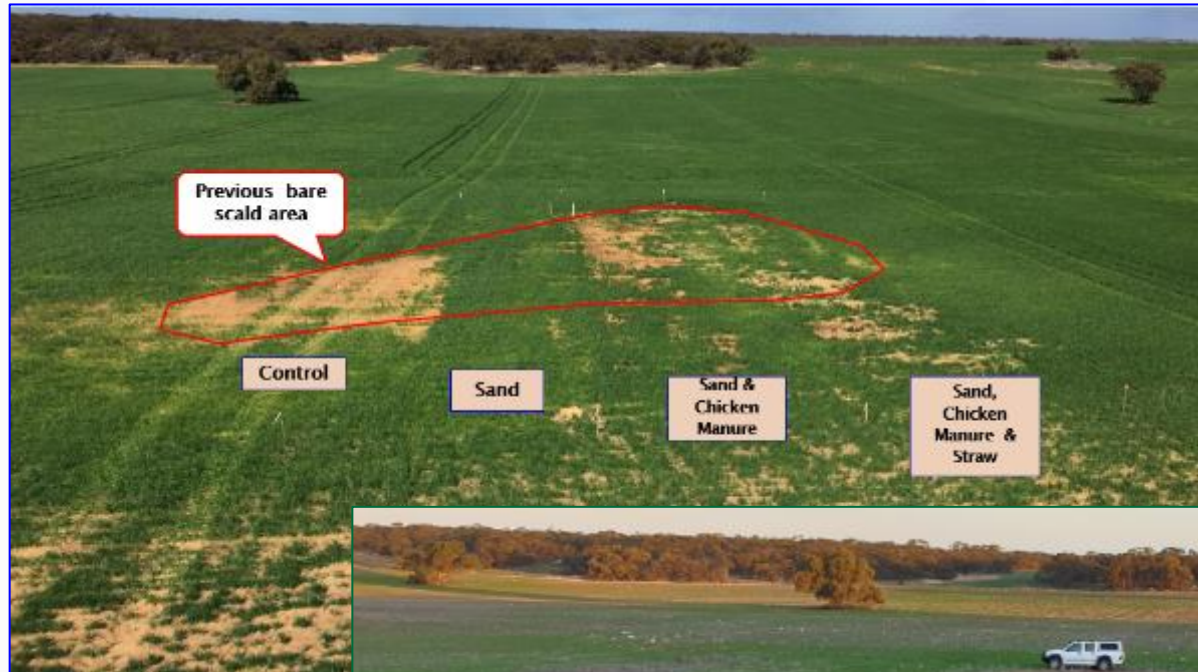
Tall wheat grass dominating surrounding area



Demo Site 4: "Halting the spread of a growing 10 year salt scald/swamp through lucerne and puccinellia" Andrew Thomas, Wynarka.



Demo Site 1: "Bringing recent scald back to cropping by adding sand, straw and manure" Kevin & Geoff Bond, Mannum.





Some re-scalding where sand applied. Soil being tested. This year I think enough lucerne was established to stop the water flow into scald.

Take Home Message:

1. Stop the flow
2. Spread the Sand
3. Sow the crop.

Hopefully now with lucerne established this site can be fully recovered to crop.

Demo Site 8: Restoring new seep back to cropping using a lucerne strip & sand covering in 250mm rainfall zone. Tim Paschke, Waikerie



15cm sand strip
placed on top of
bare scald using
land plane...



Successful crop
grown where
15cm sand
placed on top of
bare scald...

Demo Site 9: Bringing established salt scald back to cropping using lucerne, st & deep sand covering" Kevin & Geoff Bond, Mannum







Demo Site 5: Bringing saturated scalds back to grazing using strategic tree line, saltbush and salt tolerant pastures. Dave Arbon, Wynarka

GRDC
GRASS RESEARCH



Demo Site 6: Using germinated puccinellia seedlings to establish cover over historic highly saline salt scald. Simon Martin, Karoonda



Demo Site 6: Using germinated puccinellia seedlings to establish cover over historic highly saline salt scald. Simon Martin, Karoonda



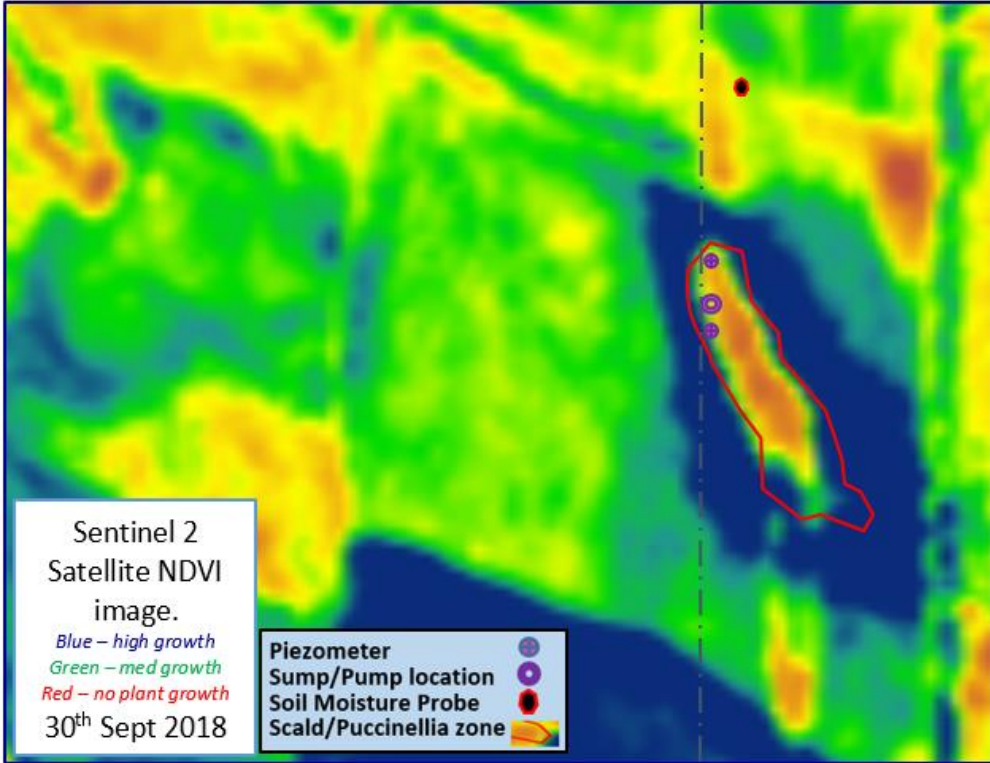
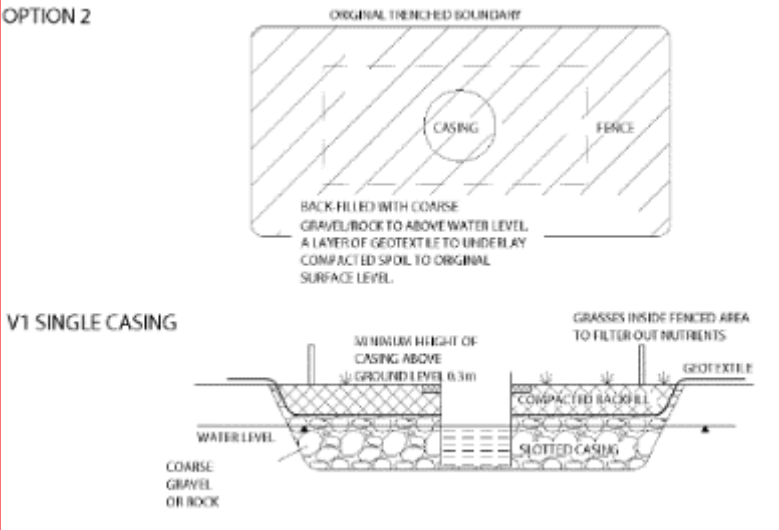
Baldock Site, Kimba



Baldock Site, Kimba



Can we collect, pump and use water before scald areas for stock, spraying or irrigation?



Baldock Site, Kimba







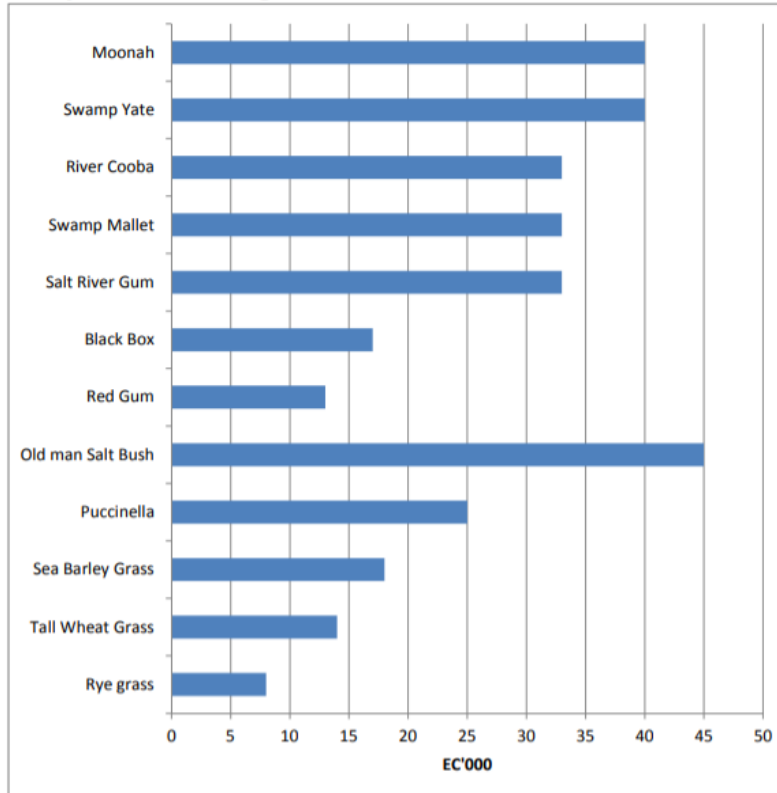






Water Table Salinity - Critical Range for Growth

Common Name	EC	Scientific Name
Rye grass	8	<i>Lolium rigidum</i>
Tall Wheat Grass	14	<i>Thinopyrum ponticum</i>
Sea Barley Grass	18	<i>Hordeum marinum</i>
Puccinella	25	<i>Puccinellia ciliata</i>
Old man Salt Bush	45	<i>Atriplex nummularia</i>
Red Gum	13	<i>Eucalyptus camaldulensis</i>
Black Box	17	<i>Eucalyptus largiflorens</i>
Salt River Gum	33	<i>Eucalyptus sargentii</i>
Swamp Mallet	33	<i>Eucalyptus spathulata</i>
River Cooba	33	<i>Acacia stenophylla</i>
Swamp Yate	40	<i>Eucalyptus occidentalis</i>
Moonah	40	<i>M. pubescens</i>



Questions/dilemmas/comments...



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or phone 0408 085 393),

for the MSF and EP Mallee Seep Projects



**Insight
Extension
for Agriculture**



**Mallee
Sustainable
Farming**



**LANDSCAPE
SOUTH AUSTRALIA
EYRE PENINSULA**



**For lucerne seed
donation**

This project is supported by the Murraylands and Riverland Landscape Board through funding from the Australian Government's National Landcare Program and the landscape levies.



**National
Landcare
Program**



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