



Managing Mallee Seeps.

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Session plan...

- ▶ **Mallee Seeps**
 - ▶ 5 key steps to fixing seeps
 - ▶ Demonstration of Mallee Seeps Decision Tree
 - ▶ Using DecipherAg NDVI app to assess your mallee seep demonstration
- ▶ **Dry Saline Land**
 - ▶ What is it and how does it work
 - ▶ Current practices and recommendations for overcoming
- ▶ **Questions...**

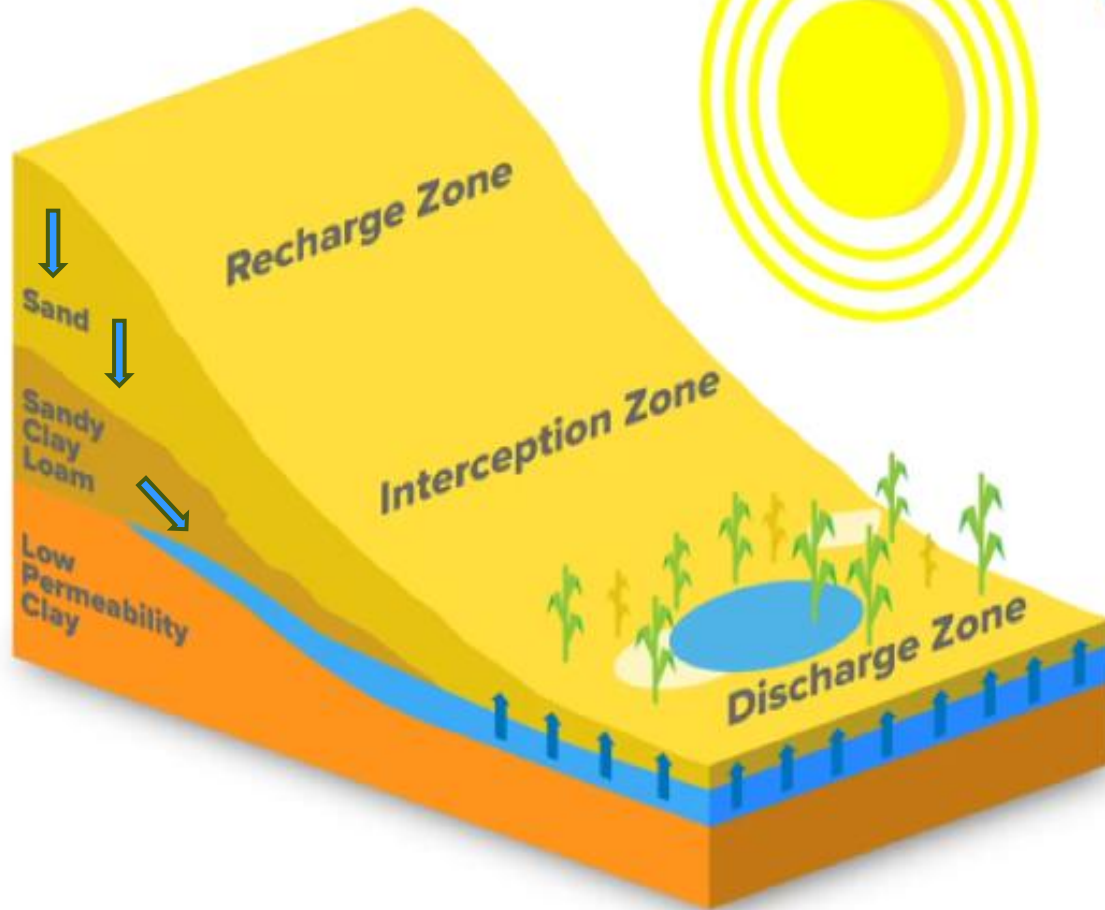


What is a Mallee Seep?

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.



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.

Mallee Seeps Decision Tree

An interactive tool for the identification and rehabilitation of Mallee Seeps

5 steps to assess and fix Mallee Seeps?

Watch consultant, Dr Chris McDonough, talk through the steps you need to go through to arrive at the best management decisions.

An aerial photograph showing a mallee seep, a type of wetland. The landscape is characterized by numerous small, rectangular mounds of earth, likely mallee mounds, arranged in a grid-like pattern. A person wearing a blue shirt and a white hard hat is kneeling in the center of the image, examining the soil. The ground is a mix of light brown and tan colors, with some darker patches. The overall scene is a natural, somewhat desolate environment.

5 Key Steps to Assess and Fix Mallee Seeps

Mallee Seeps Decision Tree

1. Do you have a Mallee Seep?

Mallee Seeps should not be confused with other forms of saline land degradation that have very different causes and will require different management strategies. These include:



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.



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.



Click to choose



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 log dry periods.



Click to choose

2. Where is the excess water most likely coming from?

Stand at the seep area and assess the landscape to identify the likely recharge, discharge and possible interception zones of the excess water.



Use [NDVI satellite imaging](#) to assist in assessing the size of the perched water table, the areas of high recharge and to target the best areas for strategic high water use management options.

Using Decipher NDVI imaging app

MANAGE

See and compare plant growth at selected locations based on single-day satellite images.

Ok, got it!

OPACITY

PLANT DENSITY ⓘ

Low Standard High

0.10 0.50

Low density High density

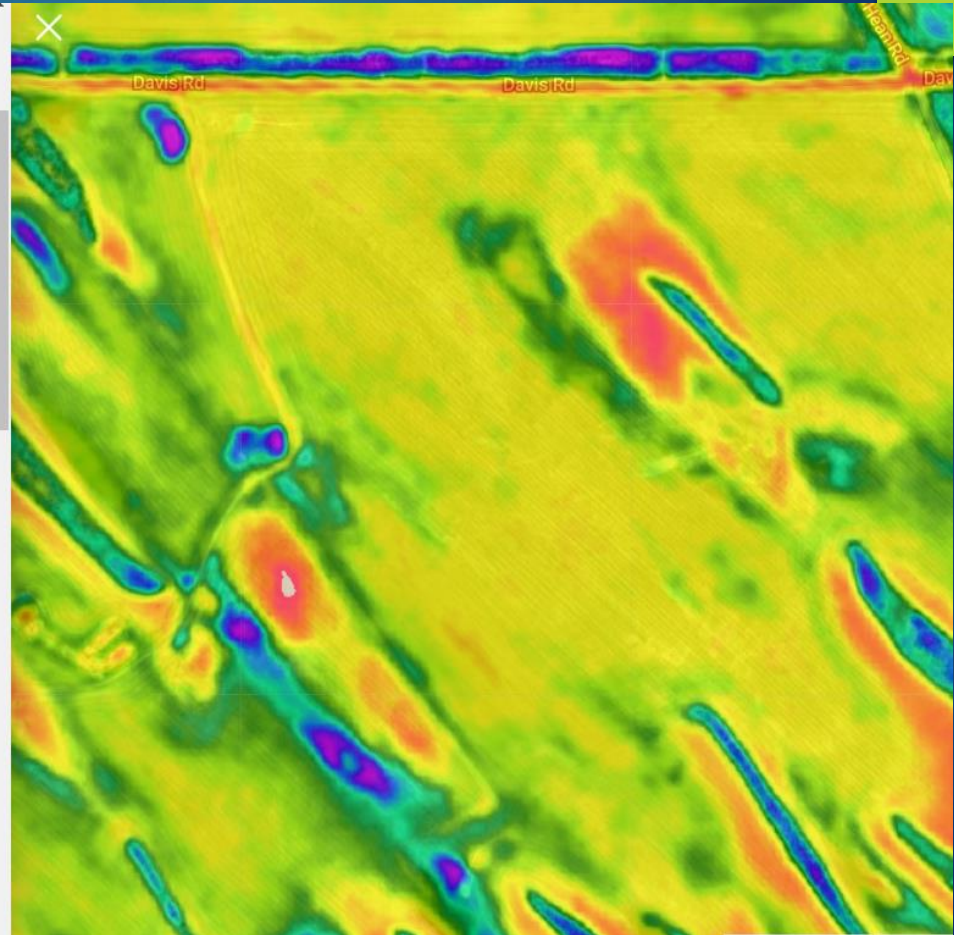
VIEW BY DAY ⓘ

< 2021 2022 2023 >

< October November December >

30 Nov 2022 **HD** 9%

29 Nov 2022 **SD** 12%



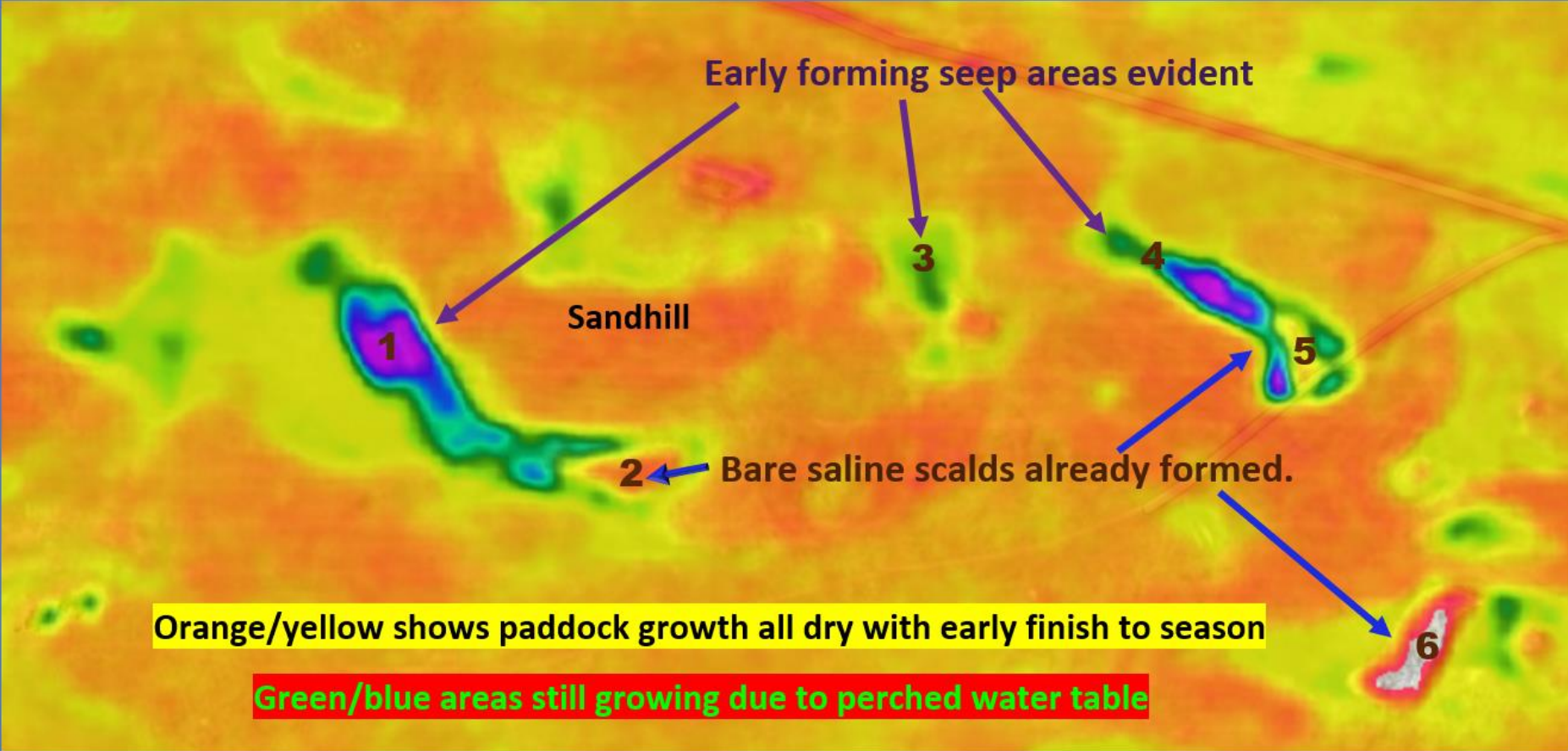
Using Satellite Images to Assess your Seeps



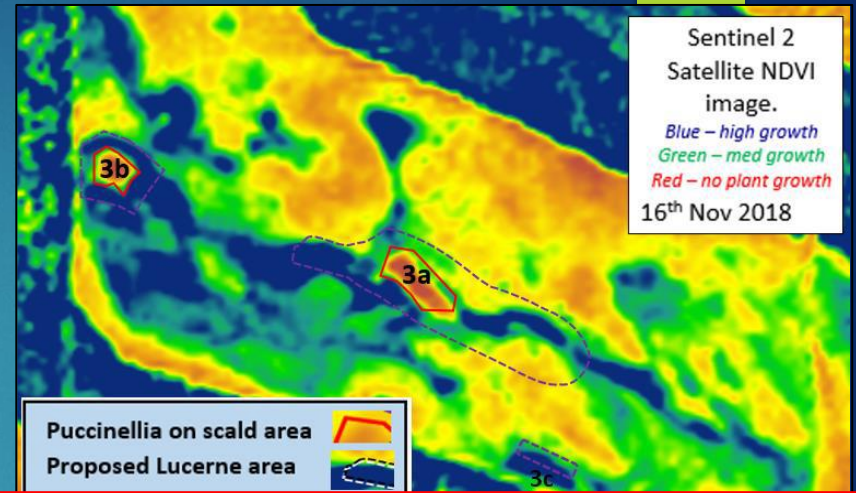
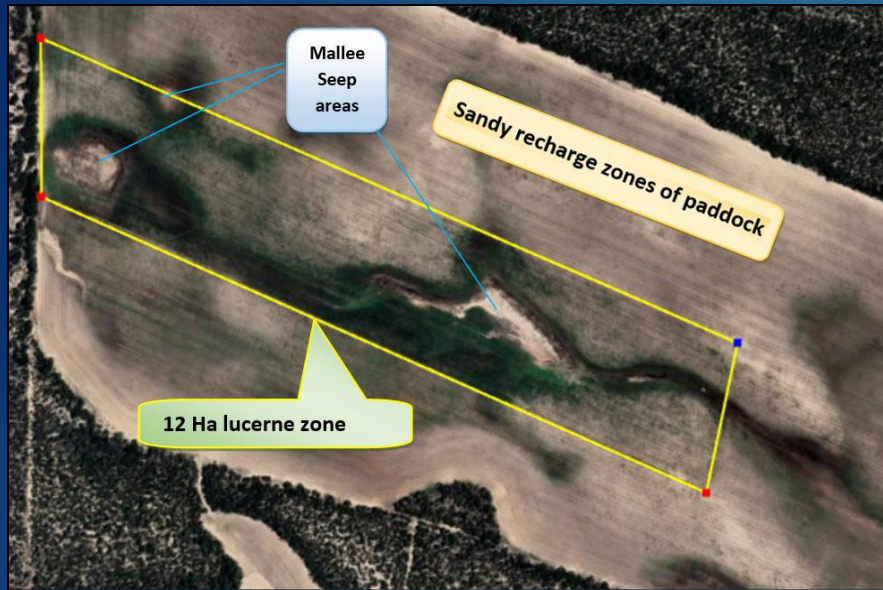
Image © 2023 CNES / Airbus

Google Earth

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.



Assessing how seeps sites may be connected through local catchments



3. What stage of Seep Development are you in?

It's important to analyse which stage of seep development that your land or area is currently in. In order to appropriately assess the stage, you should analyse your **Discharge Zone** (seep affected area) and compare with the following characteristics:



Early Mild Phase

The **"Early Mild Phase"** can present as:

- small areas of increased plant growth,
- waterlogged areas with machinery trafficking issues,
- dominant ryegrass invading crops and pasture areas,
- plant stress and poor growth beginning in the centre of affected areas, as plant roots begin to find excess water, which may be fresh or saline.



Click to choose



Intermediate Moderate Phase

The **"Intermediate Moderate Phase"** develops with:

- expanding areas of no crop/pasture germination,
- plants around edges becoming stressed and dying,
- bare patches that begin to scald out in dry periods, and
- salt tolerant volunteer species may begin to establish throughout area, and
- extended periods of surface ponding after rainfall at some sites.



Established Severe Phase

Over time these will grow into the **"Established Severe Phase"**, consisting of;

- large, bare, degraded, unproductive saline scalds,
- white salt crystals in a dry crusty surface, or blackened topsoils when wet,
- areas that may continue to expand depending on landscape and seasons.



Click to choose



4. What is the salinity level of the perched water table?

You can calculate the salinity level a number of ways, but our recommendation is to dig a hole to the perched water table and test a water sample for salinity.



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
<small>1dS/m = 100 mS/m = 1000 µS/cm = 640ppm = 640mg/L</small>		

Low to Medium
 <16 dS/m or <10,000 ppm

✔

High to Very High
 >16 dS/m or >10,000 ppm

✘

Click to choose

5. Your decision tree results

DEVELOPMENT PHASE

Intermediate Moderate Phase

WATER SALINITY LEVEL

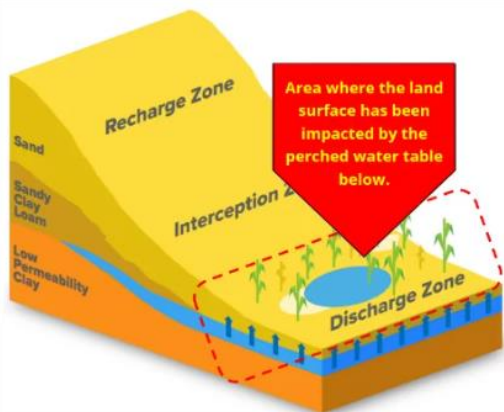
Low to Medium Salinity

KEY COMMENTS

While scalded areas are relatively small and topsoils at a less toxic stage, full restoration is possible provided immediate steps are taken to stop the excess water flows.



DISCHARGE ZONE MANAGEMENT



There are 3 paths that can be taken on the discharge zone, depending on the site situation and the farmers management preferences.

One option is to establish puccinellia / tall wheat grass on developing bare patches to maintain perennial cover and restore topsoil health within a few years. This will be dependent on reducing the flow of water into the seep zone to lower or dry out the perched water table. The area can be maintained for permanent cover and grazing, or turned back to crop production once topsoil is back to health.

[Saltland Pasture Manual](#)





A third option is to concentrate on utilising the excess water in the discharge seep area by permanently filling it with saltbush and salt tolerant pastures, without trying to intercept the flow of water into these areas. This is more suited to livestock farmers and its success will depend on the catchment area being small enough as to not overwhelm the

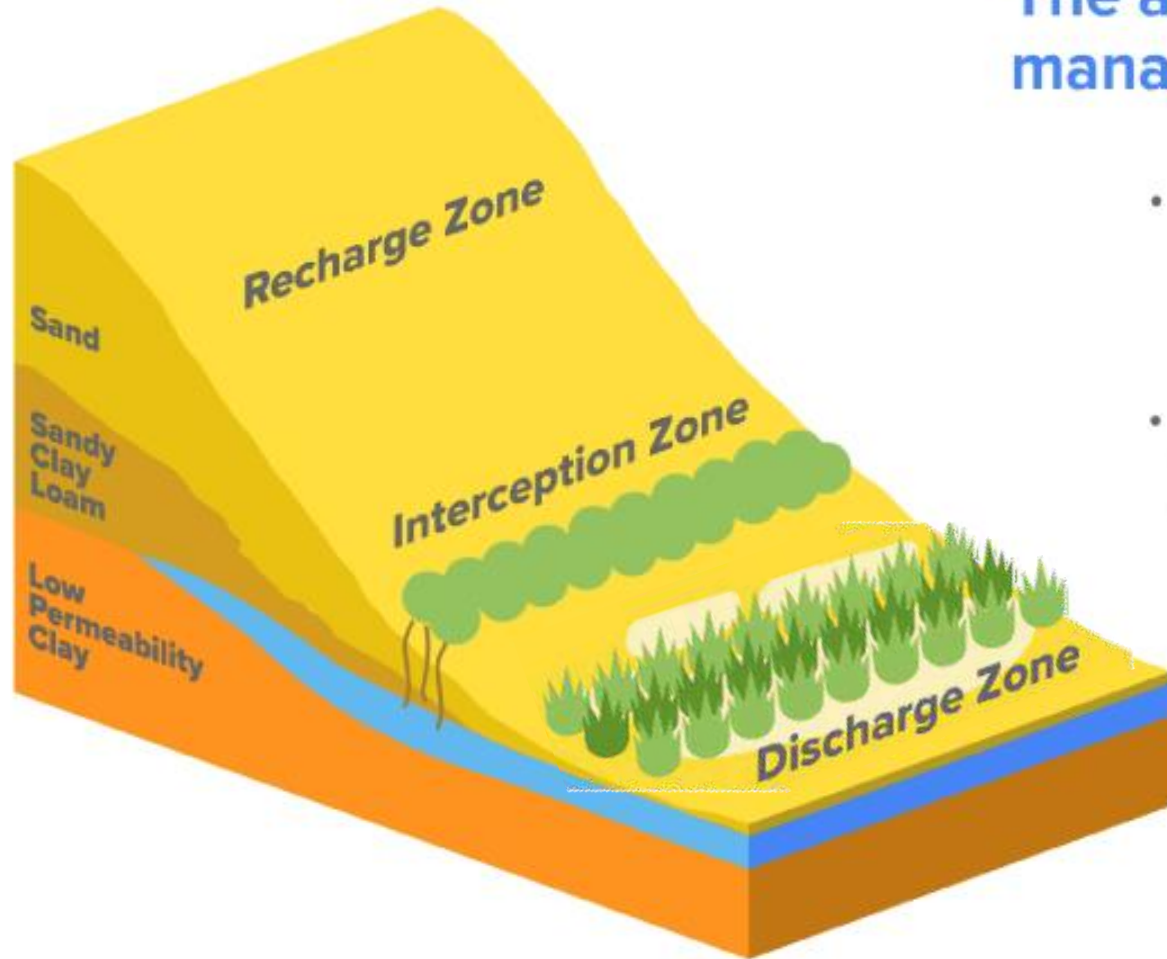


2 main aims for all

Mallee Seep Management:

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

The aim of all seep management strategies is to:



- Establish living soil cover over Discharge Zone to limit capillary rise and evaporation while restoring soil health;
- Lower or dry up the perched water table by utilising excess water within the interception zone.

Establishing puccinellia by roughening surface and spreading on surface



Keep grazing off establishing puccinellia:



Examples of Mallee Seep Decision Tree success stories:



Bringing a severe seep back into production



Share



0:26 / 5:43



Established Severe Seep at Karoonda



Nov 2020

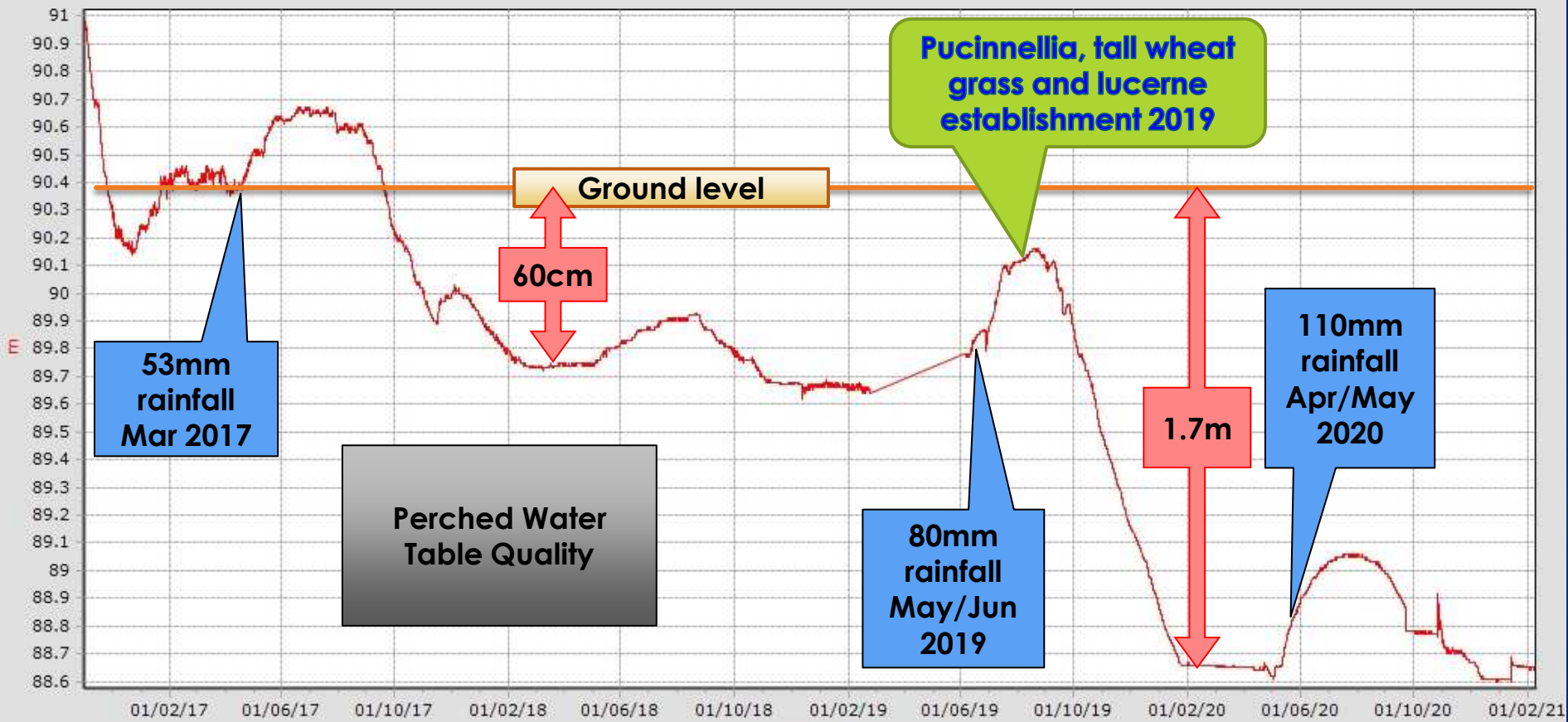
Puccinellia in original scald/lake

Lucerne drying up sandhill water

Tall wheat grass dominating surrounding area



Dramatic rapid drop in water after treatment



Fixing a Mallee Seep with Lucerne & Puccinellia, Kimba





*Hand spreading cut puccinellia heads over
large seep site at Rudall.*

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



Before...



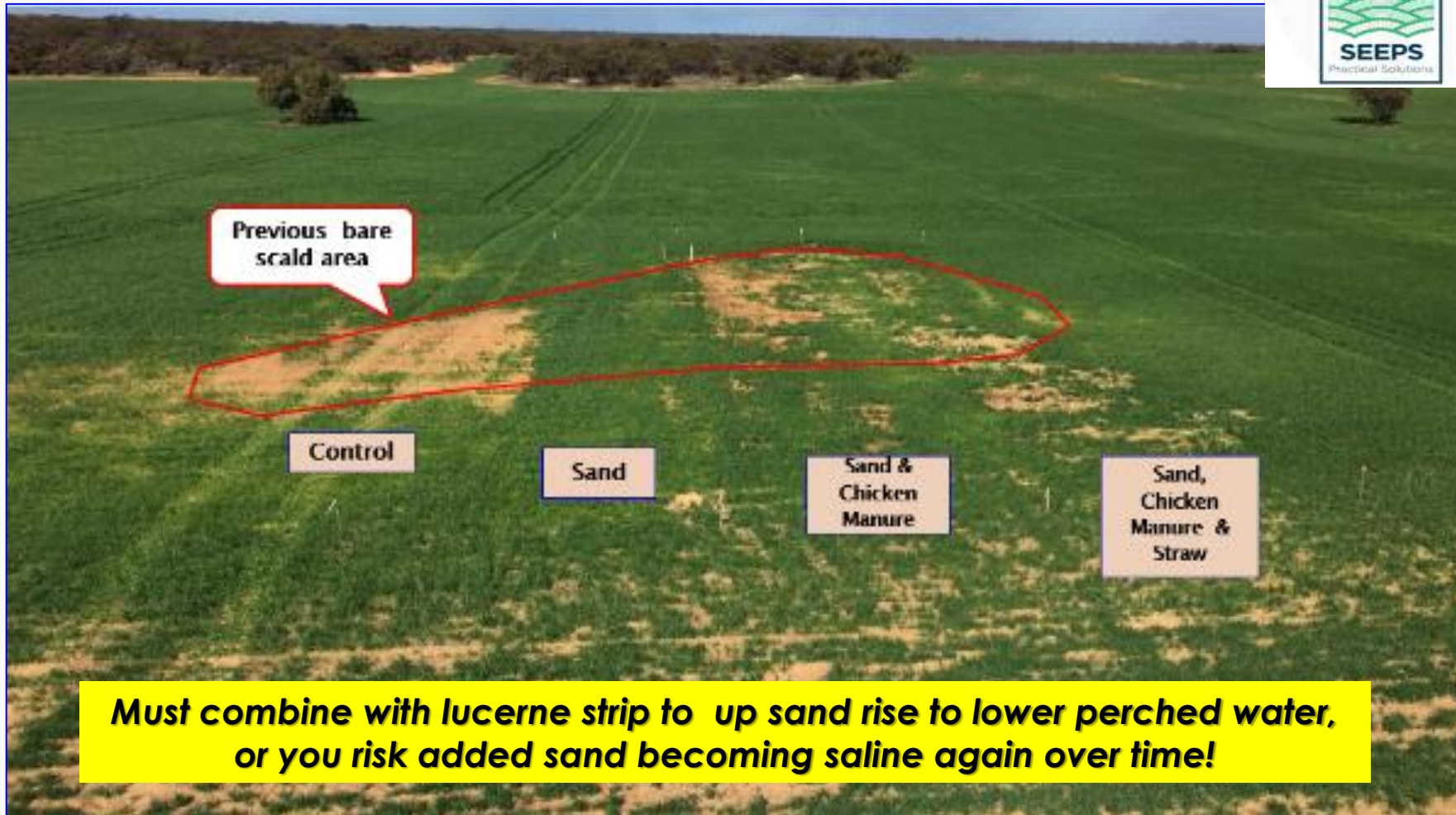
After...



**Pinnaroo seep site with highly saline water table:
Lucerne strip effectively intercepts & dries up water table 30m up
sandy rise to where perched water table was only half as saline.**



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



Must combine with lucerne strip to up sand rise to lower perched water, or you risk added sand becoming saline again over time!

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 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



We established that it could grow on this site...



Then in wet
2022 both
seedlings
and spread
seed went
crazy!!



*Original highly saline, established Karoonda site
which had doubled in size after 2016...*



Change in 2023, after planting, spreading seed and getting the right conditions.



**Early Mild Phase at Lock fixed prior to scalding:
Growing 2x crop due to excess water, but just beginning to bare out**



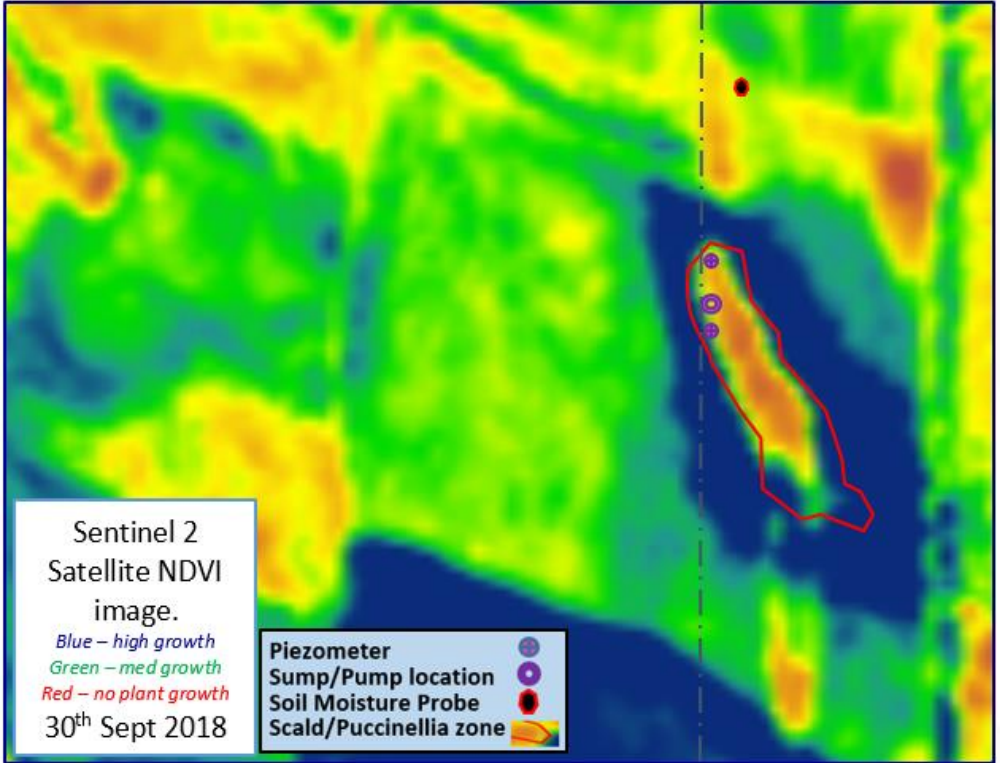
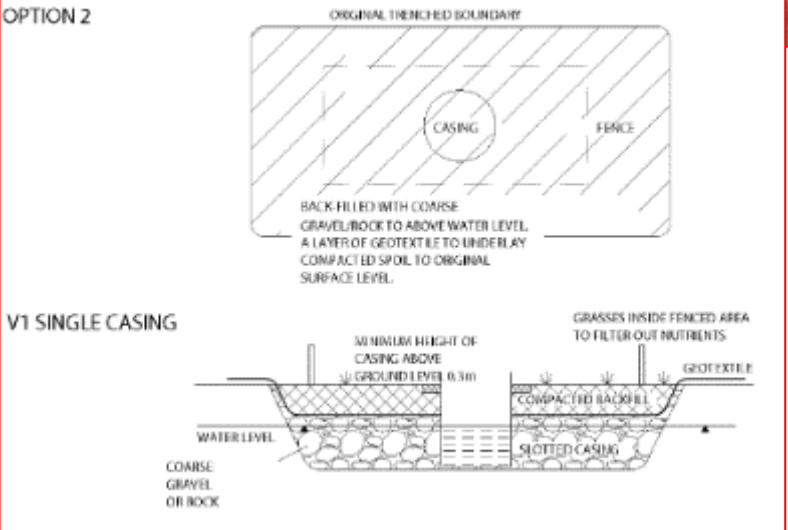
Perched water table now dried out, protecting a further 3-5ha from potential degradation.



Baldock Site, Kimba



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



Baldock Site, Kimba, using excess mallee to feed livestock...



Need to build a covered sump to collect water from, as open dams quickly degrade water quality





Thanking sponsors of / contributors to various mallee seep projects:



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Department of Agriculture,
Water and the Environment



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