

Increasing Awareness and Management of Mallee Seeps on Eyre Peninsula

PROJECT SUMMARY 2019-2023

1. Introduction

Reports from farmers to the then Eyre Peninsula Natural Resources Management Board staff in 2016, indicated the potential occurrence of seeps and soaks in the landscape in the eastern Eyre Peninsula.

For Eyre Peninsula there was little understanding of how Mallee seeps occur, no answers on how to stop them spreading or where they will appear in the landscape in the future. The appearance and growth of potential seeps was seen as impacting farm sustainability, and possible land degradation and erosion risks if not controlled.



In 2018, the Eyre Peninsula Landscape Board received funding through the National Landcare Program (NLP) to deliver a five-year Regenerative Agriculture Program in the region. A small component of this program was aimed at gaining a better understanding of the extent, spread and impact of seeps in the landscape, from a farmer's perspective.

As the understanding of the scale and complexity of Mallee seeps in the region has developed, additional funding was sourced through the NLP Smart Farm Small Grants program to establish six demonstration sites monitored using piezometers with different treatments applied. This smaller project assisted Mallee Sustainable Farming with the development of a [Mallee seep decision tree](#), to step farmers and advisors through identification and treatment options. This project ran from July 2020 to June 2022.

At the same time the Regenerative Agriculture Program continued to raise awareness of Mallee seeps and supported NDVI mapping and development of surveying methodologies of specific sites identified by farmers.

Under this program by June 2023, 120 farmers would have increased awareness of the importance of improving detection and management of Mallee seeps and the current extent of Mallee seeps across the region would be mapped.

2. Background

When did Mallee seeps first appear on Eyre Peninsula?

The formation of seeps across eastern and central Eyre Peninsula has been growing over several years. They were first reported as fresh water wet areas in a paddock in 2000, with the majority appearing in 2008 – 2011. Some seeps also appeared in 2012-2014. Since then, they have expanded in size and spread causing loss of production, and soil degradation in the dune swale landscape. There has also been an increase in seep numbers across Eastern Eyre Peninsula since significant summer rainfalls in January 2022.

What causes Mallee seeps?

Mallee seeps have become a growing farmland degradation issue across the SA/VIC Mallee for many years. This has been due to the move toward more intensive farming systems, initially through clearance of native vegetation on sandy rises, now where summer weed control strategies have led to reduced water use.

In time this has led to localised perched water tables causing waterlogging, scalding and salt accumulation in surface layers. It has been exacerbated by a combination of high out of season rainfall periods contributing high water recharge into these catchments, as well as dry, hot periods of high evaporation and capillary rise bringing more salt to surface scalds.

How do we know it is a Mallee seep?

There are several key indicators that a seep area may be forming. Initially (and often more evident through drought years), the crop below a sandy rise or lower in a catchment area may produce substantially higher growth or yield, due to accessing the extra moisture from the beginnings of a perched freshwater table. It is not uncommon to find a distinct saturated layer of soil within the top one metre (sometimes slightly deeper) where this is happening. Ideally, this is the time to commence remedial action, well before it turns into a growing degraded soil area.



Barley grass growing as an 'indicator' of an area at risk of salinisation.

The site is usually followed by annual ryegrass or barley grass becoming very thick and dominant through a cereal or pasture phase. Ryegrass tends to be more tolerant and responsive to these conditions, persisting well into summer with a very large seed set (likely to have a high percentage of hard seed). It is not uncommon for farmers to find tractors suddenly sinking to their axles and causing major operational disruptions around these sites.

As the seep areas grow and the perched water table gets closer to the surface, bare scalded areas start to emerge, essentially due to anaerobic soil conditions that are detrimental to most plant growth. Depending on rainfall and landscape, it is possible that surface ponding may occur for periods after rainfall events. This is a critical phase, as these bare soil conditions, particularly over the heat of summer, will lead to capillary rise of the moisture, evaporation, and accumulation of salt at the surface to levels too toxic for crop growth.



Bare scald appearing as seep develops.

In recent years it has become evident that while the wet years (such as 2010/11 and 2016) have resulted in much of the excess water issues occurring in these catchments, it is the drier years with less plant growth and longer periods of heat and evaporation that greatly exacerbate the spread of surface salt accumulation.



Rising perched water table.

3. Outputs

Targeted site inspections with a scientist were undertaken in the identified Mallee seep fields to understand the extent and impact on the productivity and what actions farmers have or were prepared to undertake.

Mallee seeps and soaks workshops and property visits were held with the aim to raise awareness of Mallee seeps. Farmers in the target area were surveyed to gauge interest, understanding and extent of the seeps and soaks.

1. NDVI mapping and surveying methodologies

Three sites at various locations and stages of development were established on properties to investigate the dynamics of EP Mallee seeps, and to demonstrate practical and effective strategies to manage them. These sites could then be monitored and provide demonstrations for farmer awareness raising.



Bare areas of seep affected land, leading to further investigation with NDVI mapping.

Sites were mapped using aerial photography and NDVI images to assist in better understanding the extent of Mallee seeps on properties, and the potential for new incursions.



Aerial photo and NDVI image showing Mallee seeps and emerging Mallee seeps.

A range of treatments have been undertaken, recognising that each site was different:

- establishing cover on saline scalds with salt tolerant grasses to help cover, protect and revive the productive potential of these sites.
- sowing of lucerne as a deep-rooted perennial high-quality pasture and summer growing crops, both on and surrounding mallee seep areas, to intercept local recharge water flows and to reduce and dry out the perched water tables that are causing the degradation.
- the placement of sand on early forming scald areas to allow soil cover to re-establish without having to resort to salt tolerant grasses.
- the pumping of fresh water from a seep to use for stock water on the farm while assisting in seep scald rehabilitation.



Lucerne established on an at-risk area.

Developing a regional map highlighting current and potential seeps is not possible. The one on one property visits and mapping exercises highlighted the unique nature of the development of seeps. Basic approaches using salt tolerant pastures and targeted higher water use lucerne strategies were often engaged, but each site is quite unique in landscape soils and dynamics, stages of development and farming systems.

A [“Mallee Seep Decision Tree”](#) has been developed, providing an interactive online guide to all aspects of Mallee seeps identification and management. Farmers are encouraged to use this tree to assist in clarifying the issue and whether it is actually a Mallee seep forming.

It is now recommended that farmers look, monitor and act early, rather than allow degraded areas to form, expand and go out of production. The worst current scenario is to allow areas to remain damp and bare over the hot summer and autumn. Where damp spots persist, sowing summer crops such as sorghum and millet directly over these patches to obtain and maintain living cover and use up excess moisture through to seeding time is recommended. This strategy may need to be repeated in some sites to preserve them against scalding out.

The further extension to the original EP Mallee Seeps project with support from the EP Landscape Board is now allowing for some modifications to site management and vital information gathering and reporting, particularly after the extremely high and extended rainfall in 2022 across most of Eyre Peninsula.

2. Workshops and raising awareness

Workshops with site inspections were held to provide the opportunity for farmers to better understand the issues with Mallee seeps, identification of Mallee seeps and options for treatment.



“Sticky Beak” days or crop walks, where farmers travel around their local district to check out things of interest, and Farmer Meetings, where information is formally presented in an indoor venue, were held across the areas of concern:

- Buckleboo Farm Improvement Group crop walk, 65 in attendance.
 - visited two sites, both with management treatments in place
- Rudall/Tuckey Stickybeak day, 55 in attendance.
 - 1 transitional phase Mallee seep site visited with consultant Chris McDonough to talk through management options.
- Lock/Murdinga/Tooligie Stickybeak day, 45 in attendance.
 - 1 early mild phase seep visit and discussion around management treatments that could be used as well as identification.
- Crossville Ag Bureau Stickybeak day, 18 in attendance.
 - 1 transitional phase Mallee seep site visited with consultant Chris McDonough to talk through management options.
- Eastern Eyre Peninsula Mallee seeps and soaks workshop Wednesday 20 February 2019, Rudall
- Mallee Seep presentation at Upper EP Farmer Meeting, Rudall March 2021
 - At the Rudall Farmer Meeting held on 11 March 2021, Chris McDonough, Insight Extension for Agriculture, presented on the differences between three types of salinity commonly found on Eyre Peninsula – transient salinity, dry saline land (magnesia patches) and perched water tables (Mallee seeps). He then described the features of Mallee seeps, how they are formed, the impact they have on farming systems and how they might be prevented or ameliorated (early intervention is the best option for management). 18 people attended the meeting.
- Upper EP Farmer Meetings in 2022, presentation by Chris McDonough raising awareness of Mallee seeps as well as identification and management:
 - Kimba Farmer Meeting, 15 people in attendance.
 - Cowell, 12 people in attendance.
 - Rudall, 10 people in attendance.
 - Lock, 16 people in attendance.

More than 200 farmers either attended Mallee seep sites or heard a formal presentation regarding how to identify and manage Mallee seeps as a result of the Regenerative Agriculture project.

Presentations and farm meetings increased farmer understanding and awareness of Mallee seeps as indicated through feedback from attendees:

- “Opened my eyes up”.
- “Will be going home and doing something this afternoon”.
- “Seeing the proof in the pudding was excellent”.
- “Informative. I will grow some puccinellia and use the decision tree.”
- “Good to see the different things we can do.”
- “Good starting point for someone with just some new small patches emerging.”
- “Quite interested in lucerne, especially if we can sow through it once established.”



4. What's the future?

Localised seeps are a growing land degradation issue across cropping zones of southern Australia and come about through a combination of landscape and seasonal factors as well as changes associated with modern farming systems. New technologies such as NDVI Satellite imaging are providing important resources for the identification of developing seeps and the potential threat posed to farmer's paddocks if left unmanaged.

The development of tools to monitor suspect and at-risk seep areas would provide greater opportunity to manage early. But it would still be subject to rainfall and rotational information, which is vital to understanding the imagery data.

Because no landscape analysis for Mallee seeps had been done in this area previously, a purely desktop analysis of NDVI imagery for Mallee seeps would be insufficient to identify locations. It may, however, assist in identifying potential sites, also gauging the extent of the area.

Into the future farmers need to continue to look, monitor and act early, rather than allow degraded areas to form, expand and go out of production. The worst current scenario is to allow areas to remain damp and bare over the hot summer and autumn. Sowing summer crops such as sorghum and millet directly over these patches to obtain and maintain living cover and use up excess moisture through to seeding time is an acceptable management strategy for a cropping system, although stopping the recharge with deep rooted perennials has proven to be the best management strategy.

A farmer survey was conducted in 2019 and again in 2023, to determine changes in levels of knowledge and awareness. The low farmer response to the surveys in both years conducted was disappointing, survey fatigue and timing would likely be a large contributor to this. The surveys do show an increase in area affected, and that farmers are growing increasingly concerned about Mallee seeps. Despite a range of activities through both the Regenerative Agriculture Program and the National Landcare Program funded Mallee seep project (including an online decision tree which



steps people through the management options for Mallee seeps), as well as presentations at various 'sticky beak days' or crop walks and workshops, there is still a knowledge gap for farmers to feel confident in implementing management strategies.

Only one person that completed the survey was aware of the Mallee seep decision tree online, so there is a need to promote this tool to the right audience.

An Australian Government Future Drought Fund project, *'Building drought resilience with landscape scale remediation of saline land'* to address salinity, including Mallee seeps, has commenced across a consortium of grower groups and research organisations throughout NSW, VIC and SA.